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10 CFR 50.55a

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC (Duke Energy)
McGuire Nuclear Station, Unit 2
Docket No. 50-370
Relief Request Serial #11-MN-002

Pursuant to 10 CFR 50.55a(a)(3)(i), Duke Energy hereby submits the enclosed alternative to the reactor vessel inservice inspection (ISI) interval requirements of the ASME Code, Section XI, IWB-2412.

As indicated in PWR Owners Group Letter OG-10-238 dated July 12, 2010, the current McGuire Unit 2 reactor vessel ISI date is 2014 (plus or minus one outage). Duke Energy requests extension of this ISI date to 2024 (plus or minus one outage).

The proposed alternative provides for an acceptable level of quality and safety, consistent with 10 CFR 50.55a(a)(3)(i). Duke Energy requests NRC approval of this relief request by September 1, 2012.

The attachment to this letter contains the relief request. If you have any questions or require additional information, please contact P.T. Vu at (980) 875-4302.

Sincerely,

Regis T. Repko

Attachment

A047
NRR

xc:

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ATTACHMENT

Relief Request 11-MN-002

McGuire Unit 2

Proposed Alternative
In Accordance with 10 CFR 50.55a(a)(3)(i)
-Alternative Provides Acceptable Level of Quality and Safety-

1. ASME Code Component(s) Affected

The affected component is the McGuire Unit 2 Reactor Vessel, specifically the following American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (BPV) Code Section XI (Reference 1) examination categories and item numbers covering examinations of the reactor vessel (RV). These examination categories and item numbers are from IWB-2500 and Table IWB-2500-1 of the ASME BPV Code, Section XI.

Examination Category	Item No.	Description
B-A	B1.11	Circumferential Shell Welds
B-A	B1.21	Circumferential Head Welds
B-A	B1.22	Meridional Head Welds
B-A	B1.30	Shell-to-Flange Weld
B-D	B3.90	Nozzle-to-Vessel Welds
B-D	B3.100	Nozzle Inside Radius Section

(Throughout this request the above examination categories are referred to as "the subject examinations" and the ASME BPV Code, Section XI, is referred to as "the Code.")

2. Applicable Code Edition and Addenda

ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1998 Edition with the 2000 Addenda.

3. Applicable Code Requirement

IWB-2412, Inspection Program B, requires volumetric examination of essentially 100% of reactor vessel pressure-retaining welds identified in Table IWB-2500-1 once each 10-year interval. The McGuire Unit 2 third 10-year inservice inspection interval is scheduled to end July 15, 2014.

4. Reason for Request

An alternative is requested from the requirement of IWB-2412, Inspection Program B, that volumetric examination of essentially 100% of reactor vessel pressure retaining Examination Category B-A and B-D welds be performed once each ten-year interval. Extension of the inspection interval for Examination Category B-A and B-D welds from 10 years to up to 20 years will result in a reduction in man-rem exposure.

5. Proposed Alternative and Basis for Use

Duke Energy proposes to defer the ASME Code required volumetric examination of the McGuire Unit 2 Category B-A and B-D reactor vessel full penetration pressure retaining welds during the third inservice inspection interval until 2024 (plus or minus one outage).

In accordance with 10 CFR 50.55a(a)(3)(i), an alternate inspection interval is requested on the basis that the current inspection interval can be extended based on a negligible change in risk by satisfying the risk criteria specified in Regulatory Guide 1.174 (Reference 2).

The methodology used to demonstrate the acceptability of extending the inspection intervals for Category B-A and B-D welds based on a negligible change in risk is contained in WCAP-16168-NP-A, Revision 2 (Reference 3). This methodology was used to develop a pilot plant analysis for Westinghouse, Combustion Engineering, and Babcock and Wilcox reactor vessel designs and is an extension of the work that was performed as part of the NRC PTS Risk Re-Evaluation (Reference 4). The critical parameters for demonstrating that this pilot plant analysis is applicable on a plant-specific basis, as identified in WCAP-16168-NP-A, Revision 2, are identified in Table 1. By demonstrating that each plant-specific parameter is bounded by the corresponding pilot plant parameter, the application of the methodology to the McGuire Unit 2 reactor vessel is acceptable as shown in Table 1 below.

Table 1 Critical Parameters for Application of Bounding Analysis

Parameter	Pilot Plant Basis	Plant-Specific Basis	Additional Evaluation Required?
Dominant Pressurized Thermal Shock (PTS) Transients in the NRC PTS Risk Study are applicable	NRC PTS Risk Study (Reference 4)	PTS Generalization Study (Reference 5)	No
Through-Wall Cracking Frequency	1.76E-08 Events per year (Reference 3)	6.49E-12 Events per year (Calculated per Reference 3)	No
Frequency and Severity of Design Basis Transients	7 heatup/cooldowns per year (Reference 3)	Bounded by 7 heatup/cooldowns per year	No
Cladding Layers (Single/Multiple)	Single Layer (Reference 3)	Multi-Layer	No

Additional information relative to the McGuire Unit 2 reactor vessel inspection is provided in Table 2. This information confirms that satisfactory examinations have been performed on the McGuire Unit 2 reactor vessel.

Table 2 Additional Information Pertaining to Reactor Vessel Inspection

Inspection methodology:	The most recent inservice inspection of the Category B-A and B-D welds was performed to ASME Section XI Appendix VIII requirements. Code case N-613-1 was invoked as an alternative to Section XI requirements for inspection of the Category B-D nozzle to shell welds. Code case N-648-1 visual in lieu of volumetric of the Category B-D inner radius inspection was invoked as an alternative to Section XI requirements.
Number of past inspections:	Two 10-Year inservice inspections have been performed.
Number of indications found:	Three indications were identified in the beltline region during the most recent inservice inspection. These indications, which were acceptable per IWB-3510-1 of Section XI of the ASME Code, were less than 1" from the outside diameter surface of the reactor vessel. The lack of any indications near the inside surface meets the requirements of the Alternate PTS Rule, 10 CFR 50.61a (Reference 6).
Proposed inspection schedule for balance of plant life:	The welds for which relief is requested are scheduled to be examined by 2014. Future examinations of these welds shall be performed in 2024 (plus or minus one outage).

Table 3 provides additional information relative to the calculation of the Through Wall Cracking Frequency (TWCF) for McGuire Unit 2.

Table 3 Details of TWCF Calculation – Performed for 60 Effective Full Power Years (EFPY)

Inputs

Reactor Coolant System Temperature, T_{RCS}[°F]:	N/A	T_{wall} [inches]:	8.62

No.	Region/Component Description	Material / Flux Type	Cu [wt%]	Ni [wt%]	R.G. 1.99 pos.	C.F. [°F]	Un-Irradiated RT_{NDT} [°F]	Fluence [10^{19} Neutron/cm^2, E > 1.0 MeV]
1	Lower Shell Forging	A 508-2	0.150	0.880	1.1	115.8	-30	3.79
2	Inter. Shell Forging	A 508-2	0.153	0.793	2.1	84.0	-4	3.74
3	Int/Lower Circ Weld	GRAU LO	0.039	0.724	2.1	31.5	-68	3.66
4	Upper Shell Forging	A 508-2	0.25	0.89	1.1	203.05	25	0.216
5	Upper./Int. Circ. Weld	SAF 89	0.11	1.00	1.1	148	10	0.216

Outputs

Methodology Used to Calculate ΔT_{30}:	Regulatory Guide 1.99, Revision 2

	Controlling Material Region No. (From Above)	RT_{MAX-XX} [R]	Fluence [10^{19} Neutron/cm^2, E > 1.0 MeV]	FF (Fluence Factor)	ΔT_{30} [°F]	$TWCF_{95-XX}$
Circumferential Weld - CW	4	603.97	0.216	0.587	119.28	0.00
Forging – FO	4	603.97	0.216	0.587	119.28	2.60E-12
$TWCF_{95-TOTAL}$ ($\alpha_{CW}TWCF_{95-CW} + \alpha_{FO}TWCF_{95-FO}$):						6.49E-12

6. Duration of Proposed Alternative

This request is applicable until 2024 (plus or minus one outage) for McGuire Unit 2.

7. Precedents

1. Duke Energy Carolinas, LLC (Duke), McGuire Nuclear Station Unit 1, Docket No. 50-369, "Relief Request Serial # 09-MN-003" dated June 29, 2009 [Safety Evaluation dated June 28, 2010 (ADAMS Accession Number ML101610306)].

2. Calvert Cliffs Nuclear Plant Unit No. 2, Docket No. 50-318, "Revised Request to Extend the Inservice Inspection Interval for Reactor Vessel Weld Examinations – Relief Requests (ISI-020 and ISI-021)," dated October 1, 2008 (ADAMS Accession Number ML082760282).

3. Donald C. Cook Nuclear Plant Unit No. 2, Docket No. 50-316, "Request for Relief to Extend the Unit 2 Inservice Inspection Interval for the Reactor Vessel Weld Examination and Request for License Amendment for Submittal of ISI Information and Analyses," dated October 9, 2008 (ADAMS Accession Number ML082980354).

4. Indian Point Nuclear Generating Units Nos. 2 and 3, Docket Nos. 50-247 and 50-286, "Request for Relief to Extend the Unit 2 and 3 Inservice Inspection Interval for the Reactor Vessel Weld Examination and Request for License Amendment for Submittal of ISI Information and Analyses," dated July 8, 2008 (ADAMS Accession Number ML081980058).

8. References

1. ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition with the 2000 Addenda, American Society of Mechanical Engineers, New York.
2. NRC Regulatory Guide 1.174, Revision 1, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," November 2002.
3. WCAP-16168-NP-A, Revision 2, "Risk-Informed Extension Of The Reactor Vessel In-Service Inspection Interval", June 2008.
4. NUREG-1874, "Recommended Screening Limits for Pressurized Thermal Shock," March, 2007 (ADAMS Accession Number ML070860156).
5. NRC Letter Report, "Generalization of Plant-Specific Pressurized Thermal Shock (PTS) Risk Results to Additional Plants," Revised December 14, 2004 (ADAMS Accession Number ML042880482).
6. Code of Federal Regulations, 10 CFR Part 50.61a, "Alternate Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," U.S. Nuclear Regulatory Commission, Washington D. C., Federal Register, Volume 75, No. 1, dated January 4, 2010, with corrections in No. 22 dated February 3, 2010, No. 44 dated March 8, 2010, and No. 227 dated November 26, 2010.

7. Revised Final Safety Evaluation by the Office Of Nuclear Reactor Regulation Topical Report WCAP-16168-NP-A, Revision 2, "Risk-Informed Extension Of The Reactor Vessel In-Service Inspection Interval", July 26, 2011 (ADAMS Accession Number ML111600303).
8. OG-06-356, "Plan for Plant Specific Implementation of Extended Inservice Inspection Interval per WCAP-16168-NP, Revision 1, 'Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval.' MUHP 5097-99, Task 2059," October 31, 2006 (ADAMS Accession Number ML082210245).
9. OG-10-238, "Revision to the Revised Plan for Plant Specific Implementation of Extended Inservice Inspection Interval per WCAP-16168-NP, Revision 1, 'Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval.' PA-MSC-0120," July 12, 2010 (ADAMS Accession Number ML11153A033).