

10 CFR 50.55a

January 17, 2018

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

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: End of Interval Relief Request Associated with the Third Ten-Year Inservice Inspection (ISI) Interval

- References:
- 1) Letter from J. Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "End of Interval Relief Request Associated with the Third Ten-Year Inservice Inspection (ISI) Interval," dated September 29, 2017
 - 2) Email from V. Sreenivas (U.S. Nuclear Regulatory Commission) to T. Loomis (Exelon Generation Company, LLC), "Limerick Units 1 and 2: Request for Additional Information (RAI): Relief Request I3R-23 Regarding Limited Examination Coverage (EPID: L-2017-LLR-0098)," dated December 19, 2017

In the Reference 1 letter, in accordance with 10 CFR 50.55a, "Codes and standards," paragraph (g)(5)(iii), Exelon Generation Company, LLC (Exelon), requested relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." This relief request applies to the third ten-year Inservice Inspection (ISI) interval, which concluded on January 31, 2017, for the Limerick Generating Station, Units 1 and 2. The third ten-year ISI interval complied with the ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition with 2003 Addenda.

In the Reference 2 letter, the U.S. Nuclear Regulatory Commission requested additional information. Attached is our response.

There are no regulatory commitments in this response.

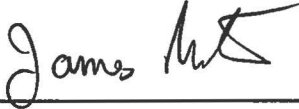
End of Interval Relief Requests

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If you have any questions concerning this response, please contact Tom Loomis at (610) 765-5510.

Respectfully,

A handwritten signature in black ink, appearing to read "James Barstow", written over a horizontal line.

James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachment: End of Interval Relief Request Associated with the Third Ten-Year Inservice
Inspection Interval - Response to Request for Additional Information

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, LGS
USNRC Project Manager, LGS
R. R. Janati, Pennsylvania Bureau of Radiation Protection

Attachment

End of Interval Relief Request Associated with the Third Ten-Year Inservice Inspection
Interval - Response to Request for Additional Information

By letter dated September 29, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17275A202), Exelon Generation Company, LLC (the licensee) submitted Relief Request I3R-23 to the U.S. Nuclear Regulatory Commission (NRC or the Commission) for the third 10-year inservice inspection interval of Limerick Generating Station (Limerick), Units 1 and 2. In its submittal of Relief Request I3R-23, the licensee requested relief from the examination coverage requirements of Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), applicable to certain ASME Code Class 1 and 2 vessel welds and nozzle inner radii. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii), the licensee requested relief on the basis that achieving the ASME Code-required examination coverage for the subject components in Relief Request I3R-23 is impractical. Section 50.55a(g)(6)(i) of 10 CFR states that the Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law; will not endanger life or property or the common defense and security; and are 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. In order to make a determination that there is reasonable assurance of structural integrity and leaktightness (and thus the request will not endanger life and property), the NRC staff requires responses to the following requests for additional information (RAIs) to complete the review of Relief Request I3R-23.

RAI 1:

Table I3R-23.1, "Limerick Generating Station, Unit 1 – List of Components with Limited Examination Coverage," of Attachment 1 of the submittal states that four indications were found during the examination of the weld BF (600290), "Shell Ring No. 2 Vertical Seam Weld (RPV)," which is an ASME Code Examination Category B-A, Item No. B1.12 weld. The licensee determined the four indications to be acceptable per ASME Section XI.

The NRC staff requests the following regarding the four indications:

- (a) Clarify that the four indications meet the acceptance standards of IWB-3510.1, "Allowable Planar Flaws," of Section XI of the ASME Code.
- (b) To ensure that the four indications are not new indications that could present a challenge to the structural integrity of the subject weld, the NRC staff requests the licensee to state whether the four indications were recorded in previous inservice inspection intervals. If they were not recorded, please explain why they were not recorded. Also, state whether there has been any other plant-specific degradation of the subject weld.

Response:

- (a) All four indications identified in 1R14 (2012) were determined to be embedded indications with no discernable through-wall dimensions, and therefore, meet the acceptance standards of ASME Section XI, Table IWB-3510-1.
- (b) Weld BF (600290) was previously examined during the second Inservice Inspection (ISI) interval in 1R09 (2002) with two indications identified. The two indications were evaluated and determined to meet the acceptance standards of ASME Section XI, Table IWB-3510-1. The two indications identified in 1R09 were also identified in 1R14 (2012) and remain unchanged.

The two additional indications identified in 1R14 (2012) are attributed to enhancements in NDE technology since the 1R09 (2002) exam. These two indications were found within the "near field" which is an area in the examination beam where it is difficult to predict the signal amplitude from a reflector due to the constructive and destructive interference of the multiple waves which originate from the transducer face. However, with a better discernable sectoral scan display, the indications could be confirmed and characterized during 1R14 (2012). Both indications were evaluated and determined to meet the acceptance standards of ASME Section XI, Table IWB-3510-1.

No additional indications or plant-specific degradation were identified in weld BF during the third ISI interval.

RAI 2:

Under the "Applicable Code Requirements" section of Relief Request 13-R23, the licensee states that the extent of examination requirement for Examination Category B-D, Item Number 83.90, per Table IWB-2500-1, requires a volumetric examination of all nozzle-to-vessel welds. The licensee further states that during the third interval, Limerick, Units 1 and 2, was approved to use ASME Code Case N-702 in a safety evaluation report dated September 9, 2010 (ADAMS Accession No. ML102390467) for Relief Request 13R-14. The licensee additionally stated that, as allowed by ASME Code Case N-613-1, Limerick, Units 1 and 2, performed a volumetric examination using a reduced examination volume (A-B-C-D-E-F-G-H) of Figures 1, 2, and 3 of the code case in lieu of the previous examination volumes of ASME Section XI, Figures IWB-2500-7(a), (b), and (c).

Code Case N-613-1 allows a modification to the examination volume to ½ inch on either side of the weld for reactor pressure vessel nozzle-to-vessel welds as shown in Figure IWB-2500-7, (a), (b), and (c). Code Case N-702 allows a reduction in the sample size for BWR RPV nozzle-to-vessel welds from 100 percent of the welds to 25 percent of the welds of a given type of nozzle. The technical basis of Code Case N-702 does not mention a reduced examination volume for the RPV nozzle-to-vessel welds. Therefore, the NRC staff is concerned that use of both Code Cases N-702 and N-613-1 for the same nozzles may not be consistent with the technical basis of Code Case N-702.

However, the examination coverage diagrams for several of the RPV nozzle-to-vessel welds appear to show that the licensee attempted to examine the full volume specified in Figure IWB-2500-7, rather than the reduced examination volume allowed by Code Case N-613-1.

Therefore, the staff requests that the licensee clarify:

1. For which RPV nozzle-to-vessel welds is the reduced examination volume of Code Case N-613-1 being applied?
2. Is Code Case N-613-1 being applied to the same nozzle-to-vessel welds for which Code Case N-702 is being applied?
3. If so, justify applying Code Case N-613-1 to welds for which Code Case N-702 is also being applied.

Response:

1. The reduced volume of Code Case N-613-1 was applied to nozzle-to-vessel welds beginning with the 1R13 (2010) and 2R11 (2011) refuel outages for the Limerick Generating Station, Units 1 and 2. Prior to 2010, examinations were performed in accordance with Figure IWB-2500-7(b). Table RAI-2-1 below identifies the nozzle-to-vessel welds that were examined in the third interval and the resultant coverage obtained after applying the reduced examination volume of Code Case N-613-1. None were limited except for the N4D nozzle-to-vessel weld on both Units, which was included in this relief request.

Table RAI-2-1: Nozzle-to-vessel welds that utilize Code Case N-613-1

Unit	Nozzle	Description	Outage Examined	Coverage Obtained	Results	Comments
1	N1A	Recirculation Suction	1R14	91.4%	RI	9 recordable indications acceptable per Table IWB-3510-1.
1	N1B	Recirculation Suction	1R16	99.3%	NRI	
1	N2C	Recirculation Discharge	1R15	98.9%	NRI	
1	N4A	Feedwater Inlet	1R14	95.6%	RI	1 recordable indications acceptable per Table IWB-3510-1.
1	N4B	Feedwater Inlet	1R15	98.2%	NRI	
1	N4C	Feedwater Inlet	1R15	98.2%	NRI	
1	N4D	Feedwater Inlet	1R15	87.3%	NRI	
1	N4E	Feedwater Inlet	1R14	95.6%	RI	1 recordable indications acceptable per Table IWB-3510-1.
1	N4F	Feedwater Inlet	1R14	95.6%	NRI	
1	N7	Head Vent	1R16	97.1%	NRI	
1	N8B	Jet Pump Instrument	1R15	97.5%	NRI	
2	N1B	Recirculation Suction	2R11	97.2%	NRI	
2	N2B	Recirculation Discharge	2R12	95.8%	NRI	
2	N2F	Recirculation Discharge	2R12	95.8%	NRI	
2	N3B	Main Steam	2R11	98.6%	NRI	
2	N4A	Feedwater Inlet	2R12	95.6%	RI	2 recordable indications acceptable per Table IWB-3510-1.
2	N4C	Feedwater Inlet	2R12	95.6%	NRI	
2	N4D	Feedwater Inlet	2R12	84.2%	NRI	
2	N7	Head Vent	2R13	92.0%	NRI	
2	N9	CRD Return	2R11	98.5%	NRI	

RI - Recordable Indication
NRI - Non-Recordable Indication

2. Code Case N-702 is not applicable to the Feedwater nozzles (N4), the CRD return nozzle (N9), and the Recirculation Suction Nozzles (N1). Code Case N-702 is applicable to the Recirculation Discharge Nozzles (N2), Main Steam Nozzles (N3), Core Spray Nozzles (N5), Head Vent and Spare Nozzles (N6 and N7), Jet Pump Instrument Nozzles (N8), and Low Pressure Coolant Injection Nozzles (N17). Table RAI-2-2 identifies the nozzle-to-vessel welds that utilize both Code Case N-613-1 and N-702.

Table RAI-2-2: Nozzle-to-vessel welds that utilize both Code Case N-613-1 and N-702

Unit	Nozzle	Description	Outage Examined	Coverage Obtained	Results	Comments
1	N2C	Recirculation Discharge	1R15	98.9%	NRI	
1	N7	Head Vent	1R16	97.1%	NRI	
1	N8B	Jet Pump Instrument	1R15	97.5%	NRI	
2	N2B	Recirculation Discharge	2R12	95.8%	NRI	
2	N2F	Recirculation Discharge	2R12	95.8%	NRI	
2	N3B	Main Steam	2R11	98.6%	NRI	
2	N7	Head Vent	2R13	92.0%	NRI	
2	N9	CRD Return	2R11	98.5%	NRI	

RI - Recordable Indication

NRI - Non-Recordable Indication

3. The technical basis for Code Case N-702 is provided in EPRI Technical Report 1016123, "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." At the nozzle-to-vessel shell weld, the BWRVIP-108NP report concluded that the conditional probability of failure is very small ($<1 \times 10^{-6}$ for 40 years) with or without any inservice inspection, and therefore, was technically justified.

Additionally, the BWRVIP-108NP report assumed fabrication and stress corrosion flaws were present in the nozzle-to-vessel weld and not the heat-affected zone or in the base material. The weld itself is examined whether applying Section XI, Figure IWB-2500-7(b) or Code Case N-613-1. The difference is in the amount of base material examined on either side of the weld. Code Case N-613-1 requires examination of the base material for a distance of 1/2" on either side of the weld. Section XI, Figure IWB-2500-7(b) requires examination of base material for a distance of half the shell thickness ($t_s/2$) on both sides of the weld. This reduction in base material examination identified in Code Case N-613-1 was approved for use without condition in Revision 14 of Regulatory Guide 1.147 in August 2005.

Therefore, the technical basis of Code Case N-702 remains applicable even when applying Code Case N-613-1 during inservice inspections because: (1) the conditional probability of failure is very small with or without any inservice inspection, and (2) the nozzle-to-shell weld volume that is examined is the same volume where assumed flaws were evaluated in the BWRVIP-108NP report.

RAI 3:

For the components in ASME Code, Section XI, Examination Categories B-D, listed in Table I3R-23.1 and Table I3R-23.2, "Limerick Generating Station, Unit 2 - List of Components with Limited Examination Coverage," in Attachment 1 of the submittal, and for the Examination Category C-B, Item No. C2.22 in Table I3R-23.1, the NRC staff requests the licensee to confirm that (1) no recordable indications were found in the components and (2) there has been no plant-specific operating experience regarding degradation of the components.

Response:

- (1) During the third ISI interval, no recordable indications were identified during examination of the Examination Category B-D components listed in Table I3R-23.1 or Table I3R-23.2. During the third ISI interval, no recordable indications were identified during examination of the Examination Category C-B, Item No. C2.22 component listed in Table I3R-23.1.
- (2) During the third ISI interval, there has been no plant-specific operating experience related to degradation of the Examination Category B-D components listed in Table I3R-23.1 or Table I3R-23.2. During the third ISI interval, there has been no plant-specific operating experience related to degradation of the Examination Category C-B, Item No. C2.22 component listed in Table I3R-23.1.

RAI 4:

The licensee included an examination coverage plot for nozzle inner radius RHR-HXAR-N4IR (244801) of Limerick, Unit 1, on page 17 of Enclosure 1 of the submittal. To gain a better understanding of the examination coverage, the NRC staff requests an examination coverage diagram similar to the other scan diagrams included in the submittal that clearly shows scan lines to the inner radius volume defined in Figures IWC-2500-4(a) or (b) "Nozzle-to-Vessel Welds" of Section XI of the ASME Code.

Response:

The examination coverage plot provided on page 17 of Enclosure 1 for the nozzle inner radius RHR-HXAR-N4IR (244801) is the only figure included in the examination datasheet. The examination datasheet also included a Nozzle Inner Radius Coverage Calculation Sheet which is contained in Enclosure 1.

Enclosure 1

Nozzle Inner Radius Coverage Calculation Sheet

**HITACHI**

Nozzle Inner Radius Coverage Calculation Sheet

Limerick Unit-1, LiR15, 2014
RHR-HXAR-N4IR (RHR Heat Exchanger Inner Radius)

Weld Length = Exam Volume =		CODE CROSS-SECTIONAL AREA		TOTAL CODE COVERAGE		
		Required Exam Area sq. in.	Area Scanned	Percent of Area	Weld Length	Percent
Zone 1 - 60°	A	3.5	2.1	60.0%	180	30.0%
Zone 1 - 80°	B	3.5	1.4	40.0%	360	40.0%
% Total Composite Coverage =						70.0%
Weld Length = Exam Volume =		CODE CROSS-SECTIONAL AREA		TOTAL CODE COVERAGE		
		Required Exam Area sq. in.	Area Scanned	Percent of Area	Weld Length	Percent
% Total Composite Coverage =						0.0%

Wade F. Miller
GE Hitachi
Level III-RT, UT, MT, PT
and VT-1,2,3
4/3/14

Rev 0 9/23/05

Comments A -Manual UT was limited due to nozzle to vessel mismatch.
B- Manual UT was limited due to nozzle configuration.

Note - Rounding methods may affect calculated values. Weld length in degrees.

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