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

January 15, 2021

Mr. David P. Rhoades
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2 – RELIEF FROM THE REQUIREMENTS OF THE ASME CODE CONCERNING VOLUMETRIC OR SURFACE EXAMINATION COVERAGE FOR THE SUBJECT WELDS (EPID L-2020-LLR-0089)

Dear Mr. Rhoades:

By letter dated June 18, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20170A267), as supplemented by letter dated October 6, 2020 (ADAMS Accession No. ML20280A513), Exelon Generation Company, LLC (the licensee) submitted relief request (RR) ISI-04-25 associated with the fourth 10-year inservice inspection interval for Calvert Cliffs Nuclear Power Plant (Calvert Cliffs), Units 1 and 2. In RR ISI-04-25, 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 components at Calvert Cliffs, Units 1 and 2.

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 volumetric or surface examination coverage for the subject welds in RR ISI-04-25 is impractical.

As set forth in the enclosed safety evaluation, the U.S. Nuclear Regulatory Commission (NRC, the Commission) staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) 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. Furthermore, the NRC staff concluded that the examinations performed, to the extent practical, provide reasonable assurance of structural integrity of the subject components. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(5)(iii). Therefore, the NRC staff grants relief from the ASME Code examination requirements for the welds included in RR ISI-04-25 for Calvert Cliffs, Units 1 and 2, for the fourth 10-year ISI interval, which ended on June 30, 2019.

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.

If you have any questions, please contact the Calvert Cliffs project manager, Michael L. Marshall, Jr., at (301) 415-2871 or by e-mail to Michael.Marshall@nrc.gov.

Sincerely,

James G. Danna

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James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosure:
Safety Evaluation

cc: Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST ISI-04-25

FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

EXELON GENERATION COMPANY, LLC

CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-317 AND 50-318

1.0 INTRODUCTION

By letter dated June 18, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20170A267), as supplemented by letter dated October 6, 2020 (ADAMS Accession No. ML20280A513), Exelon Generation Company, LLC (the licensee) submitted relief request (RR) ISI-04-25, associated with the fourth 10-year inservice inspection (ISI) interval for Calvert Cliffs Nuclear Power Plant (Calvert Cliffs), Units 1 and 2. With RR ISI-04-25, 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 components at Calvert Cliffs, Units 1 and 2.

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 volumetric or surface examination coverage for the subject welds in RR ISI-04-25 is impractical.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," components (including supports) that are classified as ASME Code Class 1, Class 2, or Class 3 must meet the requirements in 10 CFR 50.55a throughout the service life of a pressurized-water reactor, except design and access provisions and preservice examination requirements set forth in the ASME Code, to the extent practical within the limitations of design, geometry, and materials of construction of the components. Section 50.55a(g) of 10 CFR also states that ISI of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific relief has been granted by the U.S. Nuclear Regulatory Commission (NRC, the Commission), or when using the optional ASME Code cases listed in NRC Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1."

The regulations also require, during the first 10 year ISI interval and during subsequent intervals, that the licensee's ISI program complies with the requirements in the latest edition and

addenda of Section XI of the ASME Code, incorporated by reference into 10 CFR 50.55a(a), 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b)(2).

Pursuant to 10 CFR 50.55a(g)(5)(iii), "ISI program update: Notification of impractical ISI Code requirements," if the licensee has determined that conformance with an ASME Code requirement is impractical for its facility, the licensee must notify the NRC. Determinations of impracticality in accordance with 10 CFR 50.55a(g)(5)(iii) must be based on the demonstrated limitations experienced when attempting to comply with the ASME Code requirements during the ISI interval for which the request is being submitted. Requests for relief made in accordance with 10 CFR 50.55a(g)(5)(iii) must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.

Pursuant to 10 CFR 50.55a(g)(6)(i), "Impractical ISI requirements: granting of relief," the Commission will evaluate determinations under paragraph (g)(5) of 10 CFR 50.55a that ASME Code requirements are impractical. 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.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the NRC to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Summary of Request

The licensee's RR ISI-04-25 is for multiple ASME Code Class 1 and 2 component welds associated with multiple ASME Code Examination Categories for the Calvert Cliffs, Units 1 and 2, fourth 10-year ISI interval. The licensee stated that it was impractical to meet the ASME Code-required examination coverage for the subject welds in RR ISI-04-25. Specifically, due to original design of these components, it was not possible to perform volumetric examinations to the extent required by the ASME Code. The licensee stated that conformance would require extensive modifications to the components without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that achieving the ASME Code-required volumetric examination coverage for the subject welds in RR ISI-04-25 is impractical.

The ASME Code of record at Calvert Cliffs, Units 1 and 2, during the fourth 10-year ISI interval was the 2004 Edition of the ASME Code, Section XI. The fourth 10-year ISI interval at Calvert Cliffs, Units 1 and 2, ended on June 30, 2019. Additionally, the licensee stated that Calvert Cliffs, Units 1 and 2, adopted ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," which defines "essentially 100 percent" as greater than 90 percent coverage of the examination volume or surface area, as applicable. The licensee also cited use of ASME Code Case N-716, "Alternative Classification and Examination Requirements Section XI, Division 1." The licensee's use of ASME Code Case N-716 is associated with the Calvert Cliffs, Units 1 and 2, risk-informed (RI)-ISI program. ASME Code Case N-460 is an NRC-approved ASME Code alternative that can be used by a licensee, as referenced in NRC Regulatory Guide 1.147, Revision 19, "Inservice Inspection

Code Case Acceptability" (ADAMS Accession No. ML19128A244). Additionally, the licensee's RI-ISI program was approved for use during the Calvert Cliffs, Units 1 and 2, fourth 10-year ISI interval by the NRC staff's safety evaluation dated November 19, 2009 (ADAMS Accession No. ML093220090).

The NRC staff's evaluation of RR ISI-04-25 is documented according to each of the applicable ASME Code-required examination categories.

3.2 Examination Categories B-D and C-A and C-B Volumetric Examinations

3.2.1 Applicable Code Requirements

The examination requirements for Examination Category B-D, Item Numbers B3.90, B3.110, and B3.130, are provided in Table IWB-2500-1. For Item Numbers B3.90, B3.110, and B3.130, the required examination consists of essentially 100 percent volumetric examination (e.g., ultrasonic testing (UT)). The required examination volumes for B3.90, B3.110, and B3.130 are delineated in ASME Code, Section XI, Figure IWB-2500-7. The examination requirements for Category C-A, Item Number C1.10, and Category C-B, Item Number C2.21, are delineated in the ASME Code, Section XI, Table IWC-2500-1. The tables below summarize the examination results for reactor pressure vessel, steam generator, and pressurizer welds binned under Examination Categories B-D, C-A, and C-B for which the licensee is seeking relief.

	Table 1 – Examination Categories B-D, C-A, and C-B Welds with Limited Volumetric Coverage - Calvert Cliffs, Unit 1				
Item No.	**Component Identification and System**	**Limitation/ Coverage**	**Diameter/ Thickness (inch)**	**Materials**	**Examination Results**
B-D B3.110	4-405 Spray Nozzle to Head Weld	Examination limited due to nozzle configuration 66.4% coverage	11.78 (ID)/ 3-7/8	Ferritic Low Alloy Steel	No Recordable Indications
B-D B3.130	SG-12-W5, 12, Outlet Primary Head to Hot Leg B Nozzle	Examination limited due to proximity of nozzle inner radius 84.3% coverage	42/7	Ferritic Low Alloy Steel	No Recordable Indications
C-B C2.21	Inlet nozzle to channel barrel SCHE-11-N1	Examination limited due to nozzle configuration single-sided UT 50% coverage	10/0.843	Stainless Steel weld	No Recordable Indications
B-D B3.110	4-404 Nozzle to Head Weld	Examination limited due to nozzle configuration obstruction, 31.8% coverage	11.78 (ID)/ 3-7/8	Ferritic Low Alloy Steel	No Recordable Indications

	Table 1 – Examination Categories B-D, C-A, and C-B Welds with Limited Volumetric Coverage - Calvert Cliffs, Unit 1				
Item No.	**Component Identification and System**	**Limitation/ Coverage**	**Diameter/ Thickness (inch)**	**Materials**	**Examination Results**
B-D B3.130	SG-11-W5, Primary outlet nozzle to Primary Head Hot Leg	Examination limited due to proximity to nozzle radius 81.6% coverage	42/7	Ferritic Low Alloy Steel	No Recordable Indications
C-A C1.10	SCHE-11-1, Flange to Channel Barrel to Cover	UT Examination limited due to single side (62% access) 100% coverage for surface exam achieved	44/1.125	Ferritic Low Alloy Steel	No Recordable Indications
C-A C1.10	SCHE-12-2, Tube Sheet to Channel Cover	Examination limited due to configuration 75.2% coverage, single side access	44/1.125	Ferritic Low Alloy Steel	No Recordable Indications
C-B C2.21	Outlet Nozzle to Channel weld SCHE-12-N2	UT access was limited to single side access 44.15% coverage. Surface examination was achieved 100%	10/0.841	Stainless steel weld	No Recordable Indications
B-D B3.130	11B Primary Head to Cold Leg B Nozzle SG-11-W7	Examination was limited to nozzle configuration 74.2%	30/ 4-9/16	Ferritic Low Alloy Steel	The Examination was acceptable
B-D B3.130	12 A Primary Head to Cold Leg A Nozzle SG-12-W6	Examination was limited to nozzle configuration 74.2%	30/ 4-9/16	Ferritic Low Alloy Steel	The Examination was acceptable
B-D B3.130	12B Primary Head to Cold Leg B Nozzle SG-12-W7	Examination was limited to nozzle configuration 74.2%	30/ 4-9/16	Ferritic Low Alloy Steel	The Examination was acceptable
B-D B3.110	Nozzle to Head 16-405 A	Examination was limited to nozzle configuration 60.5%	7-1/4/ 3-7/8	Ferritic Low Alloy Steel	The Examination was acceptable
B-D B.110	Nozzle to Head 16-405B	Examination was limited to nozzle configuration 60.5%	7-1/4/ 3-7/8	Ferritic Low Alloy Steel	The Examination was acceptable
B-D B.130	11 A Primary Head to Cold Leg A Nozzle SG-11-W6	Examination was limited to nozzle configuration 73.8%	30/ 4-9/16	Ferritic Low Alloy Steel	The Examination was acceptable

	Table 1 – Examination Categories B-D, C-A, and C-B Welds with Limited Volumetric Coverage - Calvert Cliffs, Unit 1				
Item No.	**Component Identification and System**	**Limitation/ Coverage**	**Diameter/ Thickness (inch)**	**Materials**	**Examination Results**
B-D B3.90	Nozzle to Shell weld 10-205 A	Examination was limited to nozzle configuration 72.7%	42/ 10-3/4	Ferritic Low Alloy Steel	All 10 indications were acceptable per ASME Section XI-IWB-3512-1
B-D B3.90	Nozzle to Shell 10-205B	Examination was limited to nozzle configuration 72.7%	42/ 10-3/4	Ferritic Low Alloy Steel	All 7 indications were acceptable per ASME Section XI IWB-3512-1

	Table 2 – Examination Categories B-D, C-A, and C-B Welds with Limited Volumetric Coverage - Calvert Cliffs Unit 2				
Item No.	**Component Identification and System**	**Limitation/Coverage**	**Diameter/ Thickness (inch)**	**Materials**	**Examination Results**
C-B C2.21	Inlet Nozzle to Channel weld SCHE-21-N1	UT examination limited due to single-sided coverage 33.5%. 100% coverage was achieved with surface examination	10/0.841	Stainless steel weld	No Recordable Indications
B-D B3.110	16-405 A Safety Relief Nozzle to Upper Head Weld	Examination limited due to configuration 58.0% coverage	7.25/ 3-7/8	Ferritic Low Alloy Steel	No Recordable Indications
B-D B3.130	SG-21-W5, Primary Head nozzle extension	Examination limited due to outer diameter (OD) geometry configuration 80.2% coverage	42 ID/7	Ferritic Low Alloy Steel	No Recordable Indications
B-D B3.130	SG-21-W6, Primary Head Class A nozzle	Examination limited due to OD geometry configuration 73.8% coverage	30 ID/4-9/16	Ferritic Low Alloy Steel	No Recordable Indications
B-D B3.130	SG-22-W5, Primary Head HL Nozzle	Examination limited due to configuration 80.2% coverage	42 ID/7	Ferritic Low Alloy Steel	No Recordable Indications
B-D B3.130	SG-22-W6, Primary Head CL Nozzle	Examination limited due to configuration 73.8% coverage	30 ID/4-9/16	Ferritic Low Alloy Steel	No Recordable Indications

	Table 2 – Examination Categories B-D, C-A, and C-B Welds with Limited Volumetric Coverage - Calvert Cliffs Unit 2				
Item No.	**Component Identification and System**	**Limitation/Coverage**	**Diameter/ Thickness (inch)**	**Materials**	**Examination Results**
B-D B3.130	SG-22-W7, Primary Head CL B Nozzle	Examination limited due to configuration 73.8% coverage	30 ID/4-9/16	Ferritic Low Alloy Steel	No Recordable Indications
C-A C1.10	Channel Cover to Shell Flange weld SCHE-22-2	Examination limited due to single-sided access 83.3% coverage	44/1.125	Ferritic Low Alloy Steel	No Recordable Indications
B-D B3.110	4-404 Surge Nozzle	Examination limited due to configuration 56% coverage	11-7/8/3-7/8	Ferritic Low Alloy Steel	One indication was noted due to bore geometry, and the other indication was a spot with no dimensions and these indications were acceptable
C-A C1.10	Channel Flange to Channel Cover Shell Flange weld SCHE-21-1	Examination limited due to configuration 62.5% coverage	44/1.125	Ferritic Low Alloy Steel	No Recordable Indications. Single-sided examination
B-D B3.110	Spray Nozzle Upper Head 4-405	Examination limited due to configuration 65% coverage	4.5/3-7/8	Ferritic Low Alloy Steel	The examination was acceptable
B-D B3.130	Primary Head CL B Nozzle SG-21-W7	78% coverage	30/4-9/16	Ferritic Low Alloy Steel	The examination was acceptable
B-D B3.90	Primary Head CL B Nozzle 10-205 A	72.7% coverage	42/10-3/4	Ferritic Low Alloy Steel	All 2 indications were acceptable per ASME Section XI-IWB-3512-1

	Table 2 – Examination Categories B-D, C-A, and C-B Welds with Limited Volumetric Coverage - Calvert Cliffs Unit 2				
Item No.	**Component Identification and System**	**Limitation/Coverage**	**Diameter/ Thickness (inch)**	**Materials**	**Examination Results**
B-D B3.90	Primary Head CL B Nozzle 10-205B	78% coverage	42/10-3/4	Ferritic Low Alloy Steel	one indication was acceptable per ASME Section XI-IWB-3512-1
C-B C2.21	Outlet Nozzle to Channel weld SCHE-21-N2	UT examination limited due to single-sided coverage 46.6%. 100% coverage was achieved with surface examination	10/0.843	Stainless steel weld	No Recordable Indications
B-D B3.110	16-405B Safety Relief Nozzle to Upper Head Weld	Examination limited due to configuration 60.5% coverage	7.25/ 3-7/8	Ferritic Low Alloy Steel	No Recordable Indications

3.2.2 Licensee's Reason for Request

Due to the original design of these components, the licensee stated that it was not possible to obtain the ASME Code-required examination coverage for volumetric examinations for the subject pressure vessel, pressurizer, and steam generator welds. The welds are in reactor coolant system, feedwater, main steam, chemical volume control, and safety injection systems. Due to physical interferences, it was not possible to perform UT examinations to obtain examination coverage for essentially 100 percent of the required examination volume. Obtaining the required examination volume for these welds would require extensive structural modifications to the components or surrounding structures. The licensee further stated that a significant effort would be needed to these modifications without a compensating increase in the level of quality and safety.

3.2.3 NRC Staff Evaluation of Categories B-D, C-A, and C-B Volumetric Examinations of Vessel Welds

Examination requirements of Examination Category B-D, Item Numbers B3.90, B3.110, and B3.130, Category C-A, Item Number C1.10, and Category C-B, Item Number C2.21, require essentially 100 percent volumetric examinations covering the examination volume delineated in the ASME Code, Section XI, Figure IWB-2500-7. However, the licensee's volumetric examinations are restricted by component design, materials, and weld configurations. These conditions precluded the licensee from obtaining full access to these welds, resulting in limited volumetric examinations. To gain access for achieving examination coverage for the required examination volumes, the subject welds would require design modifications. This would place a burden on the licensee; therefore, obtaining essentially 100 percent of the ASME Code-required volumetric examinations for the subject components is considered impractical.

As shown in the sketches and technical descriptions included in the licensee's June 18, 2020, submittal, the subject components have access limitations, which resulted in reduced volumetric examination coverage. Additionally, the volumetric examinations were performed using UT with multiple angle techniques, which facilitated volume coverage of the groove and butt weld joint at the root area (for some welds) located at the inner diameter of the components. Furthermore, the staff noted that in some weld joints, the beam angle used in UT did cover the area of the surface of the weld joint. The UT examinations were performed using personnel, equipment, and procedures qualified in accordance with the ASME Code, Section XI, Appendix VIII, as implemented by the Performance Demonstration Initiative (PDI). Additionally, the staff noted that volumetric examinations were performed in accordance with Mandatory Appendix I of the ASME Code, Section XI, which requires UT examination of vessel welds greater than 2 inches thick to be conducted in accordance with ASME Section V, Article 4. If there were to be any active aging degradation in the weld joint, it would have been identified in the PDI-qualified UT examinations.

One-Sided UT Examinations:

The staff noted that for the following welds, limited access issues posed challenges for one-sided UT examinations for Calvert Cliffs:

(1) Unit 1: SCHE-11-N1, SCHE-12-N2, SCHE-11-1, and SCHE-12-2
(2) Unit 2: SCHE-21-N1, SCHE-21-N2, SCHE-21-1, and SCHE-22-2

The NRC staff finds that due to geometric limitations associated with the aforementioned welds, it was impractical to meet the ASME Code-required "essentially 100 percent" volumetric examination coverage for the subject welds during the fourth 10-year ISI interval. Although the ASME Code-required coverage could not be obtained, the PDI-qualified-ultrasonic techniques employed provided nearly full volumetric coverage from the near side of the welds, which also facilitated some limited volumetric coverage for the weld materials on the opposite (i.e., far) side of these welds. However, far side detection of flaws from a single-sided scan is considered to be a "best effort." The staff expects that had significant flaws been present on the far side of the weld, they would have been detected by the licensee. Therefore, the staff finds that the licensee's achieved examination coverage with acceptable results constitutes a "best effort" and is considered justified and acceptable.

For the nozzle welds (i.e., SCHE-11-N1, SCHE-12-N2, SCHE-21-N1, and SCHE-21-N2), the maximum UT coverage was only 50 percent, and the remaining welds stated above had larger surface area of inspection coverage. The licensee reiterated that it had 100 percent access to perform surface examination of these nozzle welds. In order to ensure that there is no active aging degradation in these welds, the licensee performed surface examination, and the inspection results were acceptable. Therefore, the staff concludes that the licensee had demonstrated its capability of adequately monitoring aging degradation using single-sided PDI-qualified UT examinations for these welds.

Based on the aggregate coverage obtained for the subject components, the extent of the examinations, and considering the licensee's performance of essentially 100 percent examination coverage for the accessible portions of these welds, it is reasonable to conclude that, had significant flaws been present in these welds, some evidence of unacceptable flaws would have been detected by the licensee. In this context, the staff noted that during the fourth 10-year ISI examinations, the licensee reported that except for two welds at Calvert Cliffs, Unit 1, and three welds at Calvert Cliffs, Unit 2, there are no reportable indications in the

remaining subject welds at Calvert Cliffs. The indications identified in two welds at Calvert Cliffs, Unit 1, were found to be acceptable in accordance with the requirements of the ASME Code, Section XI, IWB-3512-1 acceptance criteria. With respect to the indications identified in three welds at Calvert Cliffs, Unit 2, indications in two welds met the ASME Code, Section XI, IWB-3512-1 acceptance criteria. For the third weld, the indication was due to bore geometry of the nozzle, and as such, it was found to be acceptable.

Additionally, available operating experience indicates that there is no active aging degradation mechanism for full penetration groove welds of ferritic and austenitic stainless steel in pressurized-water reactor vessel components. In the absence of any known degradation mechanism, such as intergranular stress corrosion cracking or primary water stress corrosion cracking that can potentially affect the subject welds, the staff concludes that the structural integrity of these welds is not significantly compromised by the limited examinations during the fourth ISI interval at Calvert Cliffs.

Furthermore, the performance of the required VT-2 examinations through the system pressure tests provides additional assurance of structural integrity of the subject vessel components. Hence, the staff finds that the risk associated with granting the requested relief would be very low. Therefore, the staff finds the licensee's request acceptable.

3.3 Examination Category R-A, Pressure-Retaining Welds in Piping

3.3.1 Applicable ASME Code Requirements

Examination Category R-A, Item Numbers R1.11, R1.16, and R1.20, are related to the licensee's RI-ISI program and ASME Code Case N-716, "Alternative Classification and Examination Requirements, Section XI, Division 1." For Item Numbers R1.11, R1.16, and R1.20, the required examination consists of essentially 100 percent volumetric examination. The required examination volumes are delineated in ASME Code, Section XI, Figures IWB-2500-8(c) and IWB-2500-9, 10, and 11, as applicable. For reference purposes, it is noted that Item Number R1.11 is reserved for components that are subject to thermal fatigue; Item Number R1.16 is reserved for components that are subject intergranular or transgranular stress corrosion cracking; and Item Number R1.20 is reserved for components that do not have a known damage mechanism.

3.3.2 Licensee's Reason for Request

Due to the original component design limitations, the licensee stated that it was unable to obtain the ASME Code-required volumetric examination coverage for the components identified in its submittal without extensive design modifications. The tables below summarize the limitations, along with examination results, for each of the Examination Category R-A examinations for which the licensee was unable to obtain the required examination coverage volume during the fourth 10-year ISI interval at Calvert Cliffs, Units 1 and 2.

	Table 3 – Examination Category R-A Welds with Limited Volumetric Coverage - Calvert Cliffs, Unit 1				
Item No.	**Component Identification and System**	**Limitation/Cover Age**	**Pipe Size (inch)**	**Materials**	**Examination Results**
R1.11	12-PSL-10 Reactor Coolant System	Limited access Elbow-to-Pipe, 48.2% coverage	12	Austenitic Stainless Steel	Acceptable Counter Bore Indications
R1.20	12-SC-1004-2 Safety Injection	Limited access Safe end-to-Elbow 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications
R1.16	12-SI-1009-9 Safety Injection	Limited access Pipe-to-Valve, 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications
R1.20	12-SI-1010-13 Safety Injection	Limited access Pipe-to-Safe end, 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications
R1.20	12-SI-1011-12 Safety Injection	Limited access Pipe-to-Safe end, 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications
R1.20	12-SI-1012-12 Safety Injection	Limited access Elbow-to-Safe end, 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications

	Table 4 – Examination Category R-A Welds with Limited Volumetric Coverage Calvert Cliffs, Unit 2				
Item No.	**Component Identification and System**	**Limitation/Cover age**	**Pipe Size (inch)**	**Materials**	**Examination Results**
R1.16	12-SI-2009-9 Safety Injection	Limited access Pipe-to-Valve, 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications
R1.11	3-PS-2001-28 Reactor Coolant	Limited access Pipe-to-Elbow 89% coverage	3	Austenitic Stainless Steel	No Recordable Indications
R1.16	12-SI-2012-7 Safety Injection	Limited access Pipe-to-Valve, 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications
R1.20	12-SI-2010-8 Safety Injection	Limited access Valve-to-Elbow 50% coverage	12	Austenitic Stainless Steel	No Recordable Indications
R1.20	6-MS-2007-2 Main Steam	Limited access Pipe-to-Elbow 84% coverage	6	Low Alloy Steel	No Recordable Indications

	Table 4 – Examination Category R-A Welds with Limited Volumetric Coverage Calvert Cliffs, Unit 2				
Item No.	**Component Identification and System**	**Limitation/Coverage**	**Pipe Size (inch)**	**Materials**	**Examination Results**
R1.20	6-MS-2007-9 Main Steam	Limited access Pipe-to-Valve 67% coverage	6	Low Alloy Steel	No Recordable Indications
R1.11	12-PSL-12 Reactor Coolant	Limited access Elbow-to-Safe end 53.1% coverage	12	Austenitic Stainless Steel	Acceptable Counter Bore Indications
R1.11	4-PS-2003-4 Reactor Coolant	Limited access Tee-to-Valve 50% coverage	4	Austenitic Stainless Steel	No Recordable Indications
R1.20	2-CV-2005-13 Chemical and Volume Control	Limited access Pipe-to-Reducer 50% coverage	2	Austenitic Stainless Steel	No Recordable Indications
R1.20	2-CV-2005-16 Chemical and Volume Control	Limited access Reducer-to-Pipe 50% coverage	2	Austenitic Stainless Steel	No Recordable Indications
R1.20	2-CV-2018-23 Chemical and Volume Control	Limited access Pipe-to-Pipe 50% coverage	2	Austenitic Stainless Steel	No Recordable Indications
R1.11	2-CV-2005-29 Chemical and Volume Control	Limited access Elbow-to-Safe end 88.1% coverage	2	Austenitic Stainless Steel	Acceptable Weld Overlay Indications

3.3.3 NRC Staff Evaluation of Examination Category R-A Welds

Examination requirements of licensee's Examination Category R-A, Item Numbers R1.11, R1.16, and R1.20 require essentially 100 percent volumetric examinations covering the examination volume delineated in the applicable ASME Code, Section XI, Figures IWB-2500-8(c), IWB-2500-9, 10, and 11. However, the licensee's volumetric examinations are restricted by component design, materials, and weld configurations. These conditions precluded the licensee from obtaining full access from both sides of these welds, resulting in limited volumetric examinations. To gain access for achieving the required examination coverage volumes, the subject welds would require design modifications. This would place a burden on the licensee. Therefore, obtaining essentially 100 percent of ASME Code-required volumetric examinations for the subject welds is considered impractical.

As shown in the sketches and technical descriptions submitted by the licensee, and as summarized in Table 3 above, the subject Examination Category R-A welds for Calvert Cliffs, Unit 1, are all austenitic stainless steel piping welds with original design limitations that restricted obtaining essentially 100 percent volumetric examinations of the required examination volumes. For welds 12-PSL-10, 12-SC-1004-2, 12-SI-1009-9, 12-SI-1010-13, 12-SI-1011-12,

and 12-SI-1012-12, the licensee achieved from 48.2 to 50 percent examination coverage with acceptable results (i.e., geometric indications or no recordable indications).

The regulations in 10 CFR 50.55a(b)(2)(xv)(A)(2) require that examinations of austenitic welds from a single side may be credited for full coverage only after completing a single-sided Appendix VIII demonstration using flaws on the opposite side of the weld. The licensee stated that the welds were examined using the latest techniques and applicable requirements, including the requirements of the ASME Code, Section XI, Appendix VIII, and applicable PDI requirements. These techniques have been qualified through the industry's PDI, which meets the intent of the ASME Code, Section XI, Appendix VIII requirements for flaws located on the near side of the welds. However, far side detection of flaws from a single-sided scan is considered to be a "best effort" for austenitic stainless steels. However, the staff expects that had significant flaws been present on the far side of these welds, they would have been detected by the licensee. Therefore, the NRC staff finds that the licensee's achieved examination coverage from 48.2 to 50 percent with acceptable results constitutes a "best effort" and is considered justified and acceptable.

As shown in the sketches and technical descriptions submitted by the licensee, and as summarized in Table 4 above, the subject Examination Category R-A welds for Calvert Cliffs, Unit 2, consist of low alloy steel and austenitic stainless steel piping welds with original design limitations that prevented the licensee from obtaining essentially 100 percent volumetric examinations of the required examination volumes. Welds 6-MS-2007-2 and 6-MS-2007-9 are low alloy steel piping welds for which the license was able to achieve 84 and 67 percent examination coverage, respectively, with no recordable indications. Based on the aggregate coverage obtained for these ferritic welds with no recordable indications, and considering the absence of a known damage mechanism at these locations, the NRC staff finds the licensee's limited examinations for these welds justified and acceptable.

Welds 12-SI-2009-9, 3-PS-2001-28, 12-SI-2012-7, 12-SI-1010-8, 12-PSL-12, 4-PS-2003-4, 2-CV-2005-13, 2-CV-2005-16, and 2-CV-2018-23 are all austenitic stainless steel piping welds for which the licensee was able to achieve from 50 to 89 percent examination coverage with no recordable indications. As previously stated, the requirements for the examination of austenitic stainless steels from a single side may be credited for full coverage only after completing a single-sided Appendix VIII demonstration using flaws on the opposite side of the weld. The licensee stated that the welds were examined using the latest techniques and applicable requirements, including the requirements of ASME Code, Section XI, Appendix VIII, and applicable PDI requirements. These techniques have been qualified through the industry's PDI, which meets the intent of the ASME Code, Section XI, Appendix VIII requirements for flaws located on the near side of the welds. However, far side detection of flaws from a single-sided scan is considered to be a "best effort." The staff expects that had significant flaws been present on the far side of these welds, they would have been detected by the licensee. Therefore, the NRC staff finds that the licensee's achieved examination coverage from 50 to 89 percent with no recordable indications constitutes a "best effort" and is considered justified and acceptable.

Weld 2-CV-2005-29 is an austenitic stainless steel weld with a full structural weld overlay. The weld overlay configuration prevented the licensee from obtaining essentially 100 percent volumetric examination of the required examination volume. The licensee was able to obtain 88.1 percent examination coverage of the required examination volume with two acceptable weld overlay lack of bonding indications at the pipe interface. Based on information the licensee provided to the NRC by letter dated March 11, 2019 (ADAMS Accession No. ML19072A096), it

is apparent that the purpose of the full structural weld overlay was to mitigate an indication detected by the licensee on the adjoining dissimilar metal weld 2-CV-2005-30, and not weld 2-CV-2005-29. The licensee was able to obtain 100 percent coverage of the required examination volume for the dissimilar metal weld 2-CV-2005-30. Consequently, this relief request is needed and applicable to weld 2-CV-2005-29. Since weld 2-CV-2005-29 was acceptable prior to the full structural weld overlay, the staff finds that 88.1 percent examination coverage of the required examination volume for the weld overlay, with acceptable lack of bonding indications, is considered justified and acceptable.

Based on its review of the subject Examination Category R-A welds at Calvert Cliffs, Units 1 and 2, the NRC staff finds that it is impractical to meet the ASME Code-required examination coverage for the subject welds due to the design configuration of the subject components. The NRC staff also determined that the examinations performed, despite the limited coverage obtained by the licensee, provide reasonable assurance of the structural integrity for the subject welds. Additionally, the staff finds that the performance of the periodic required VT-2 examinations through the system pressure tests provides additional assurance of structural integrity of the subject components. Hence, the staff finds that the risk associated with granting the requested relief would be very low. Therefore, the staff finds the licensee's request acceptable.

4.0 CONCLUSIONS

As set forth above, the NRC staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) 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. Furthermore, the NRC staff concluded that the examinations performed to the extent practical provide reasonable assurance of structural integrity of the subject components. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(5)(iii). Therefore, the NRC staff grants relief from the ASME Code examination requirements for the welds included in RR ISI-04-25 for Calvert Cliffs, Units 1 and 2, for the fourth 10-year ISI interval, which ended on June 30, 2019.

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.

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Date: January 15, 2021

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNITS 1 AND 2 – RELIEF FROM THE REQUIREMENTS OF THE ASME CODE CONCERNING VOLUMETRIC OR SURFACE EXAMINATION COVERAGE FOR THE SUBJECT WELDS (EPID L-2020-LLR-0089) DATED JANUARY 15, 2021

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