Attachment 2 contains Proprietary Information – Withhold Under 10 CFR 2.390. Upon removal of Attachment 2, this document is decontrolled.

January 14, 2022

L-2022-015
10 CFR 50.55a

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

RE: St. Lucie Nuclear Plant, Unit 2
Docket No. 50-389
Renewed Facility Operating License NPF-16
Relief Request Number 20 – Request for an Alternative to the Requirements of the ASME Code for Examination of Reactor Vessel Closure Head Control Element Drive Mechanism (CEDM) Housing #27 Canopy Seal Weld – RAI Response

References:

1. FPL Letter L-2022-011 dated January 12, 2022, Relief Request Number 20 – Request for an Alternative to the Requirements of the ASME Code for Examination of Reactor Vessel Closure Head Control Element Drive Mechanism (CEDM) Housing #27 Canopy Seal Weld

2. Email from Natreon Jordan, NRC, to Wyatt Godes, FPL, dated January 13, 2022, RAIs for RR 20 - Alternate Examination of Canopy Seal Weld Control Element Drive Mechanism Number 27 Housing

Per Reference 1 above, Florida Power & Light Company (FPL) in accordance with the provisions of 10 CFR 50.55a(z)(2), requested Nuclear Regulatory Commission (NRC) approval of a proposed alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for use at the St. Lucie Plant.

As part of the review for Reference 1, the NRC forwarded a Request for Additional Information to clarify aspects of the submittal per Reference 2. The purpose of this letter is to provide FPL's response to the review questions. The responses are contained in the attachments to this letter.

FPL is requesting relief from ASME Code Section III, Subsection NB-5270/NB-5271 to perform a liquid penetrant (PT) surface examination of the repair/replacement of the St. Lucie Unit 2 Reactor Vessel Closure Head (RVCH) Control Element Drive Mechanism (CEDM) #27 middle canopy seal weld.

As an alternative to the dye penetrant (PT) surface exam, FPL proposes to perform an enhanced remote visual examination of the weld overlay on the repair/replacement of the CEDM #27 middle canopy seal weld overlay.

Attachment 1 to this letter contains a revised Relief Request #20. Attachment 2 contains evaluation CSTL2-CR020-TR-CF-000001-P, Revision 2, supporting Relief Request #20. Attachment 2 contains information that Westinghouse Electric Company LLC (Westinghouse) considers to be proprietary in nature. The request is supported by an affidavit signed by Westinghouse, the owner of the information. Pursuant to 10 CFR 2.390(a)(4), FPL requests the proprietary information be withheld from public disclosure. Attachment

3 provides a non-proprietary version of the evaluation provided in Attachment 2. Attachments 1, 2 and 3 supersede Attachments 1, 2 and 3 provided in Reference 1. Attachment 4 provides the Westinghouse Application for Withholding Proprietary Information from Public Disclosure CAW-22-003 affidavit supporting the proprietary withholding request. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Nuclear Regulatory Commission ("Commission") and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the commission's regulations. Accordingly, FPL requests that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations. Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-22-003 and be addressed to Camille Zozula, Manager, Regulatory Compliance & Corporate Licensing, Westinghouse Electric Company, 1000 Westinghouse Drive, Suite 165, Cranberry Township, Pennsylvania 16066.

FPL requests approval of the proposed alternative by close of business on January 14, 2022.

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Tim Falkiewicz at (772) 429-3756.

Sincerely,

Wyatt Godes
Licensing Manager
St. Lucie Nuclear Plant

WG/tf

Attachments:

1. Request for an Alternative to the Requirements of the ASME Code for Examination of Reactor Vessel Closure Head Control Element Drive Mechanism (CEDM) Housing #27 Canopy Seal Weld, Revision 1

2. CSTL2-CR020-TR-CF-000001-P Rev. 2, "St. Lucie Unit 2 CEDM Canopy Seal Weld Overlay Repair" (Proprietary)

3. CSTL2-CR020-TR-CF-000001-NP Rev. 2, "St. Lucie Unit 2 CEDM Canopy Seal Weld Overlay Repair" (Non-Proprietary)

4. Affidavit CAW-22-003

cc: USNRC Regional Administrator, Region II
USNRC Project Manager, St. Lucie Nuclear Plant, Units 1 and 2
USNRC Senior Resident Inspector, St. Lucie Nuclear Plant, Units 1 and 2

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Proposed Alternative
In Accordance with 10 CFR 50.55a(z)(2)
Request for an Alternative to the Requirements of the ASME Code for Examination of Reactor Vessel Closure Head Control Element Drive Mechanism (CEDM) Housing #27 Canopy Seal Weld

1. ASME CODE COMPONENT(S) AFFECTED:

Component:	Replacement Reactor Vessel Closure Head (RVCH) Control Element Drive Mechanism (CEDM) Housing Canopy Seal Weld
Code Class:	Class 1
Reference:	ASME Section XI, IWA-4000, ASME Section III, NB-5270
Exam Category:	NA
Code Item No.:	NA
Description:	Control Element Drive Mechanism (CEDM) Canopy Seal Weld, Specifically CEDM # 27 Middle Canopy Seal Weld
Size:	NA
Materials:	CEDM Motor Housing End: SA-182, F348 CEDM Rod Travel Housing Lower End Fitting: SA-479, Type 316 Weld Material: ER316L

2. APPLICABLE CODE EDITION AND ADDENDA:

The Fourth Ten Year ISI interval Code of record for St. Lucie Unit 2 is the 2007 Edition with 2008 Addenda of ASME Boiler and Pressure Vessel Code, Section XI, “Rules for Inservice Inspection of Nuclear Power Plant Components” [Ref. 1]. Examination of the reactor vessel CEDM middle canopy seal weld per the original code of construction was a surface examination per NB-5270.

The manufacturing Code for St. Lucie Unit 2 RVCH Control Element Drive Mechanisms (CEDM’s): ASME Boiler and Pressure Vessel (BPV) Code, Section III, “Rules for Construction of Nuclear Power Plant Components, Division 1,” 1998 Edition through 2000 Addenda [Ref. 2].

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3. APPLICABLE CODE REQUIREMENT:

IWA-4000 of ASME Code Section XI requires that replacements or repairs be performed in accordance with the owner's original Construction Code of the component or system, or later editions and addenda of the Code.

ASME Code, Section III, Subsection NB-5270 SPECIAL WELDED JOINTS.
NB-5271 Welded Joints of Specially Designed Seals
Welded joints of this type shall be examined by either the magnetic particle or liquid penetrant method.

The canopy seal weld is described in ASME Code Section III, and a repair/replacement of this weld would require the following activities:

- Machining of a groove to facilitate removal of the CEDM internal motor.
- Welding to restore the leak barrier of the original configuration canopy seal weld.
- Final surface examination.

4. REASON FOR REQUEST:

In accordance with 10 CFR 50.55a(z)(2), relief is requested on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Florida Power & Light Company (FPL) is requesting relief from ASME Code, Section III, Subsection NB-5270/NB-5271 to perform a liquid penetrant (PT) surface examination of the repair/replacement of the St. Lucie Unit 2 RVCH CEDM #27 middle canopy seal weld. As an alternative to the PT surface exam, FPL proposes to perform an enhanced remote visual examination of the weld overlay on the repair/replacement of the CEDM #27 middle canopy seal weld overlay. During a recent repositioning of the St. Lucie Unit 2 control element assemblies (CEA's) to verify operability per Technical Specification surveillance requirements, CEA #27 could not be withdrawn. Troubleshooting determined that the inability to withdraw CEA #27 was not electrical, and that the CEDM internal drive motor would require replacement.

The CEDM drive motor assembly replacement requires cutting of the CEDM middle canopy seal weld between the motor housing and the rod travel housing and unthreading the two housing components to access and replace the internal CEDM drive motor assembly. Following drive motor replacement, the existing rod travel housing will be reinstalled/threaded onto the motor housing and the middle canopy seal weld will be remade to restore the leak barrier with a root and hot pass, followed by a weld overlay of the canopy seal weld with a multiple layer weld overlay with a minimum 1/8" thickness (Figure 3) using a compatible austenitic stainless steel filler with a delta ferrite greater than 7.5 FN.

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The CEDM motor housing and the rod travel housing are Class 1 pressure boundary items. The canopy seal weld provides leak prevention barrier only and does not perform a pressure retaining function. Removal and reinstallation of the mid canopy seal weld is a Repair/Replacement activity, under the jurisdiction of ASME Code Section XI, IWA-4000.

To comply with ASME Code Section XI and the original Construction Code, a surface examination must be performed on the completed canopy seal weld overlay. The CEDM middle canopy seal weld is located above the Reactor Vessel Closure Head (RVCH) approximately 3 rows of penetrations toward the center of the head (Figure 1) and is inside the RVCH cooling shroud, providing extremely limited access for workers to reach the middle canopy seal weld for examination. This highly congested area is also subject to high radiation levels to gain access. In order to reduce the exposure to personnel involved in the welding process, the repair activities are planned to be performed remotely using machine welding equipment. However, the required dye penetrant (PT) examinations would necessitate hands on access to the middle canopy weld. In addition, equipment disassembly would be required, only to obtain limited access for an individual working from a suspended bosun's chair harness. These additional support activities would result in further exposure and unnecessary industrial safety concerns.

St. Lucie Unit 2 does not have radiological surveys in the exact location of the CEDM #27 middle canopy seal, however, a dose survey near the head surface, at a CEDM location just one row in from the outer periphery was 1.02 rem/hr and dose at the shroud access openings between 225-335 rem/hr during the previous fall 2021 refueling outage. Due to the extremely limited access and high dose rates, compliance with this ASME Code requirement would not meet the intent of the site's as low as reasonably achievable (ALARA) radiological control program and presents a hardship to the utility and workers.

Although the CEDM #27 middle canopy seal weld is not leaking and there is no reason to suspect that a flaw exists, for the purposes of the design of the weld overlay thickness [Ref 3, & Attachment 1] a postulated pre-existing through wall flaw is assumed in the original canopy seal weld for the fatigue crack growth and corrosion crack growth analyses.

As stated in [Ref.3 & 4] the weld overlay repair is designed under the guidance and requirements of ASME Section XI, 2007 Edition with 2008 Addendum [Ref. 1], Paragraph IWB-3640, "Evaluation Procedures and Acceptance Criteria for Flaws in Austenitic and Ferritic Piping," and Appendix C, "Evaluation of Flaws in Piping," as an alternative repair method for this "secondary leak barrier." Guidance is also taken from ASME Code Case N-504-4 [Ref. 5], ASME Section XI Nonmandatory Appendix Q [Ref. 1], and NUREG-0313 [Ref. 6].

Additionally, visual and/or surface examinations will be performed on the seal weld and associated base metal mating surfaces as part of the seal weld disassembly to assure the surfaces are suitable for performing the weld overlay. In the unlikely event that this NDE detects a rejectable flaw in the mid canopy seal weld mating surface materials that cannot be removed due to accessibility or tooling limitations, the design accounts for this with the

assumption of a pre-existing through wall flaw in the original seal weld secondary leak boundary.

5. PROPOSED ALTERNATIVE AND BASIS FOR USE:

Florida Power & Light Company (FPL) is requesting relief from ASME Code, Section III, Subsection NB-5270/5271 for a liquid penetrant (PT) surface examination of the repair/replacement of the St. Lucie Unit 2 RVCH penetration #27 CEDM middle canopy seal weld. As an alternative to the PT surface exam, FPL proposes to perform an enhanced remote visual examination of the weld overlay on the repair/replacement of the CEDM #27 middle canopy seal weld overlay in lieu of the surface examination required by Code. The new canopy seal weld overlay will be examined for quality of workmanship and discontinuities will be evaluated and dispositioned to ensure the adequacy of the new leakage barrier. The proposed remote enhanced visual examination would be conducted using a video camera with a minimum of 5X magnification. Lighting and acuity will be verified using ASME Code Section XI, Table IWA-2211-1, requirements for VT-1 note (2).

The 1/8" minimum thickness weld overlay is designed to have additional margin over the original canopy seal weld thickness (See Figures 2 and 3) to account for corrosion and fatigue analyses and will be the new secondary leak barrier. In accordance with this proposed overlay design, the seal weld overlay may be installed without removal of the defect, and without the associated surface examination of the defect removal area prior to welding. FPL will perform a remote enhanced visual examination on the completed weld, in lieu of the surface examination required by Code. The seal weld overlay will serve as a full replacement for the secondary leakage barrier, but will not serve any structural function, as the full structural load is still carried by the threaded connection in accordance with the original CEDM housing design.

Basis for Use

The threaded joint between the CEDM rod travel housing and the CEDM motor housing provides the primary reactor coolant system Class 1 pressure boundary and structural support for the CEDM. The canopy seal weld is for secondary leakage prevention only and is not credited in the ASME Code structural analysis. Following replacement of the internal CEDM drive motor, the middle canopy seal weld joint will be welded with a root and hot pass weld, followed by a weld overlay (Figure 3) using weld procedures and personnel qualified in accordance with ASME Code Section IX. These activities will be performed under the control of the ASME Code Section XI Repair/Replacement program.

As demonstrated in multiple similar applications provided in Section 8, Precedents, the proposed alternative enhanced visual examination technique provides higher resolution and consistency than that provided by the requirements of a visually unaided Code VT-1 visual examination and is comparable to relevant indications detectable using PT surface exam technique. Based on the remote enhanced visual examination system's ability to resolve demonstrated graduation, reasonable assurance of the weld integrity is provided by this proposed alternative.

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There is no applicable ASME Code Section XI, Examination Category or Item Number associated with this configuration as canopy seal welds are not subject to Table IWB-2500-1 surface or volumetric examinations.

Confirmation of Leak Integrity

A VT-2 inservice leakage examination is performed on the Class 1 pressure boundary at the conclusion of each refueling outage, as required by ASME Code Section XI, Table IWB-2500-1, Examination Category B-P, "All Pressure Retaining Components." In addition, a leakage examination is performed through the reactor vessel head shroud openings at the ten (10) in-core-instrumentations (ICI) penetrations at the beginning of each refueling outage as part of the St. Lucie "Reactor Coolant System Leak Test" and the Boric Acid Corrosion Control Program. In the unlikely event of leakage from the newly installed seal weld overlay, these examinations are designed to promptly identify and correct the issue. Because the rod travel housing and motor housing are both made from corrosion resistant material, and the structural threaded connection provides a torturous flow path for leakage, this type of minor leakage will not impact the integrity of any safety related carbon steel pressure boundary components. Further, St. Lucie Unit 2 has enhanced leak detection procedures to identify RCS leakage during operation.

Enhanced RCS Leakage Detection at St. Lucie Unit 2 Provides Defense in Depth

Although it is extremely unlikely that a leak would occur in the weld overlay of the middle canopy seal weld, St. Lucie has enhanced its RCS leakage detection procedures. The industry imposed an NEI-03-08 "needed" requirement, for utilities to improve their RCS leak detection capability in part due to other unrelated reactor vessel head leakage concerns with PWSCC or alloy 600 materials. St. Lucie Unit 2 has adopted the standardized approach to measuring RCS leak rate in WCAP-16423-NP [Ref.7] and has incorporated the action levels in WCAP-16465-NP [Ref. 8] as an added measure of safety. The enhanced leak rate monitoring and detection procedure monitors specific values of unidentified leakage, seven day rolling average, and baseline means. Action levels are initiated as low as when the unidentified leak rate exceeds 0.1 gpm. The enhanced leak detection capability provides an increased level of safety if a canopy seal weld flaw were to progress to a leak in this secondary barrier, although unlikely, it would be detected prior to any safety significant degradation of the carbon steel reactor vessel head or other carbon steel components.

As listed under Section 8, Precedents, this proposed alternative seal weld repair and alternative examination method have been previously implemented or proposed as a contingency on the canopy seal welds at several utilities. The remote weld repair and alternate visual examination methods result in significantly lower radiation exposure because the equipment is remotely operated.

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Conclusion

FPL has concluded that replacement of the CEDM #27 middle canopy seal weld with a root and hot pass weld followed by a weld overlay has an acceptable design [Ref. 3 & 4] to provide a quality secondary leak barrier for the CEDM #27 middle canopy seal weld. The design life includes a postulated through wall flaw of the existing canopy seal weld and fatigue and corrosion crack growth analyses that support 60 years of service from the time of installation, well beyond the current license. Further, the use of enhanced visual inspection of the weld overlay will assure a high-quality secondary leak barrier for the CEDM #27 middle canopy seal weld.

In addition, online operational leak monitoring programs and periodic visual inspections of the reactor vessel head area will continue to confirm the leak integrity of the weld overlay secondary barrier of CEDM #27.

Based on the discussion and the summary above, it is requested that the NRC authorize this proposed alternative in accordance with 10 CFR 50.55a(z)(2) as the alternative provides an acceptable level of quality and safety

6. DURATION OF PROPOSED ALTERNATIVE:

The proposed alternative is applicable for the 4th ISI interval which began August 8, 2013 and ends on August 7, 2023.

7. RESPONSE TO DRAFT NRC REQUESTS FOR ADDITIONAL INFORMATION:

Florida Power and Light Company (FPL) submitted Relief Request 20, Rev 0, to the NRC letter L-2022-011, dated January 12, 2022, (ADAMS Accession No. ML22012A139), requesting relief from examination requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, at St Lucie Nuclear Plant, Unit 2. NRC staff provided five (5) requests for additional information (RAIs) via email on January 13, 2022. Responses to RAI 1 through RAI 4 are provided in Appendix A of Revision 2 of the Vendor proprietary and non-proprietary letters, CSTL2-CR020-TR-CF-000001-P & NP [Ref. 3 & 4]. RAI 5 in summary, requested that the licensee modify Section 6, DURATION OF THE PROPOSED ALTERNATIVE of the Relief Request 20, Rev 0. In response, Section 6, DURATION OF THE PROPOSED ALTERNATIVE has been modified to request authorization for the duration of the 4th ISI interval as stated above. Other changes in RR-20 Rev 1 include replacement of Figure 3 and an update of References 3 & 4.

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8. PRECEDENTS:

1) NRC letter regarding approval of Relief Request (21-ISI-1), "Sequoyah Nuclear Plant, Unit 1 and 2-Proposed Alternative to the Requirements of ASME Code (EPID L-2021-LLR-0019), dated May 28, 2021 (ADAMS Accession Number ML21131A163)

2) NRC Letter to Exelon Generation Company, LLC, "Braidwood Station, Units 1 and 2 - Relief from the Requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (EPID L-2018-LLR-0033)," dated January 17, 2019 (ADAMS Accession Number ML18347B419)

3) NRC Letter to TVA, "Sequoyah Nuclear Plant, Unit 1 - Relief from ASME Code Repair Requirements for Canopy Seal Welds (TAC No. MA9095)," dated September 12, 2000 (ADAMS Accession Number ML003749067)

4) NRC Letter to TVA, "Relief from ASME Code Repair Requirements for Canopy Seal Welds at Watts Bar Nuclear Plant (TAC No. MA5051)," dated August 25, 1999 (ADAMS Accession Number ML073230305)

5) NRC Letter to TVA, "Relief from ASME Code Repair Requirements for Canopy Seal Welds Sequoyah Nuclear Power Plant, Unit 1 (TAC No. M93835)," dated April 4, 1996 (LL9604290167)

6) NRC letter to Duke Energy Carolinas, LLC, "McGuire Nuclear Station, Unit 1, Relief 08-MN-005, for Control Rod Drive Mechanism (CRDM) Canopy Seal Welds (TAC No. MD9875)," dated October 14, 2009 (ADAMS Accession Number ML092530620)

9. REFERENCES:

1) ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 2007 Edition thru 2008 Addendum.

2) ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Power Plant Components, Division 1," 1998 Edition thru 2000 Addendum.

3) Westinghouse Calculation, CSTL2-CR020-TR-CF-000001-P, Rev 2, "St. Lucie Unit 2 CEDM Canopy Seal Weld Overlay Repair," January 13, 2022, (Proprietary).

4) Westinghouse Calculation, CSTL2-CR020-TR-CF-000001-NP, Rev 2, "St. Lucie Unit 2 CEDM Canopy Seal Weld Overlay Repair," January 13, 2022 (Non-Proprietary).

5) ASME Boiler and Pressure Vessel Code, Code Case N-504-4, "Alternative Rules for Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping," July 14, 2006.

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6) U.S. Nuclear Regulatory Commission NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping, " January 1988.

7) WCAP-16423-NP, Rev. 0, “Pressurized Water Reactor Owners Group Standard Process and Methods for Calculating RCS Leak Rate for Pressurized Water Reactors,” Westinghouse Electric Co., September 2006. (Transmitted to the NRC – ADAMS Accession Number ML070310081)

8) WCAP-16465-NP, Rev. 0, “Pressurized Water Reactor Owners Group Standard RCS Leakage Action Levels and Response Guidelines for Pressurized Water Reactors,” Westinghouse Electric Co., September 2006. (Transmitted to the NRC – ADAMS Accession Number ML070310081)

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RELIEF REQUEST NUMBER 20 (RR20), Rev. 1

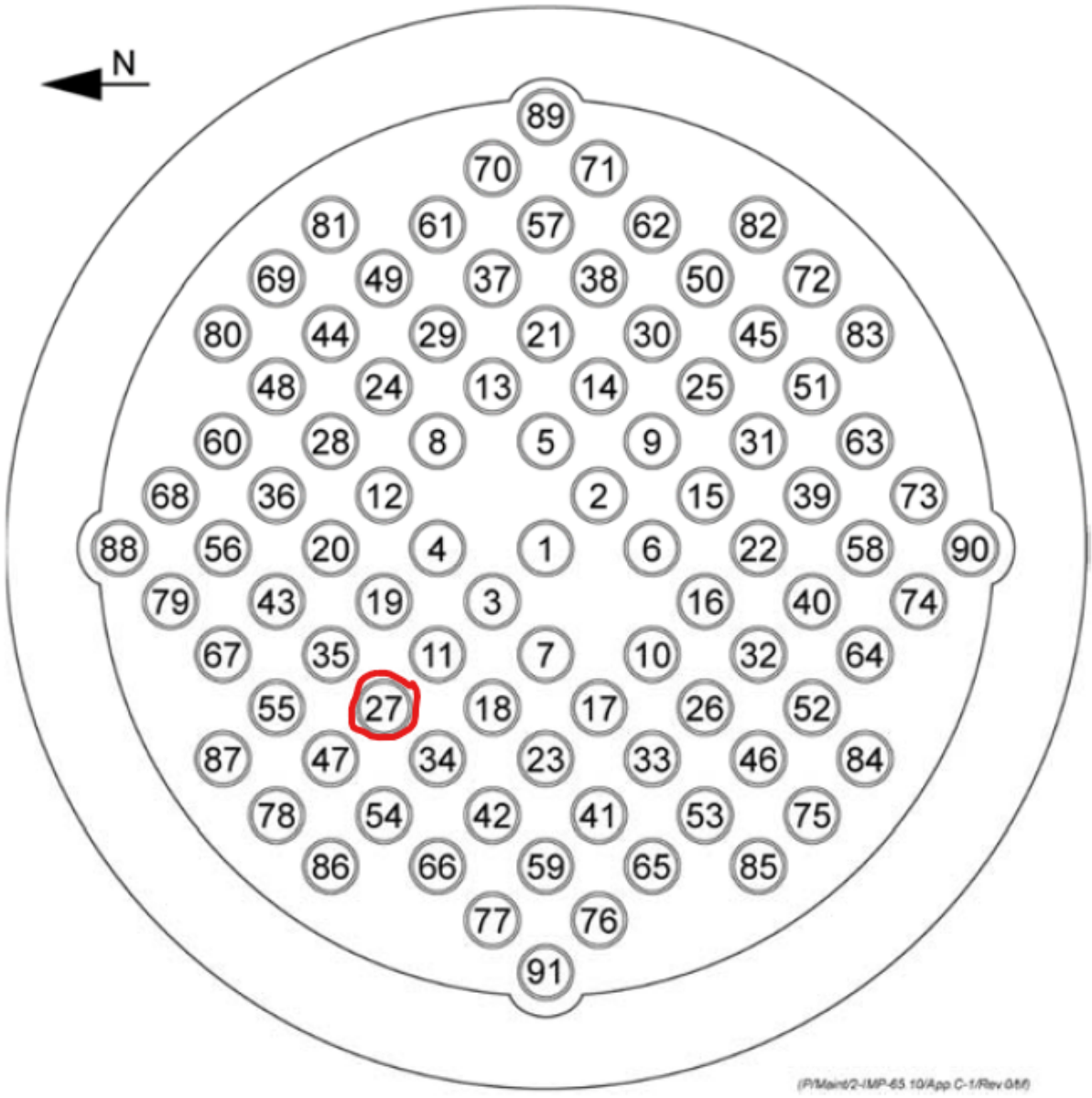

Figure 1: St. Lucie Unit 2 RVCH Penetration/CEDM Layout with CEDM Location 27 Identified (Ref. 2-PMI-65.10)

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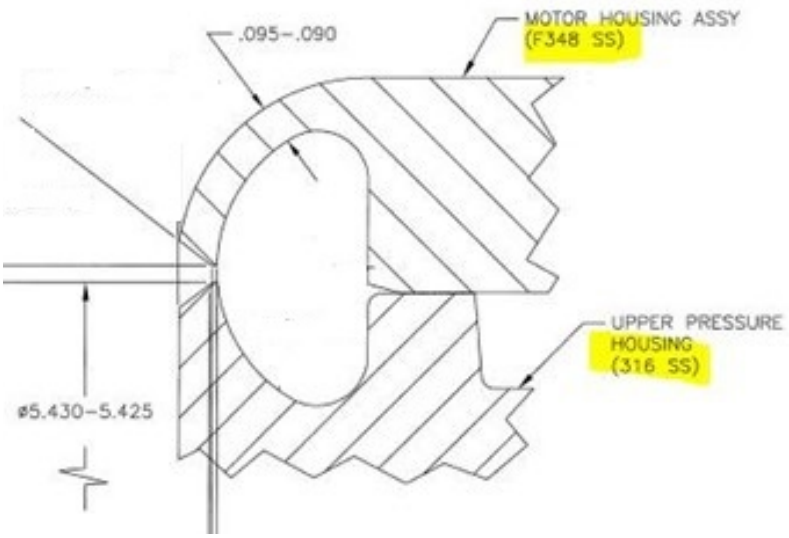

Figure 2: St. Lucie Unit 2 CEDM Middle Canopy Seal Weld Original Configuration

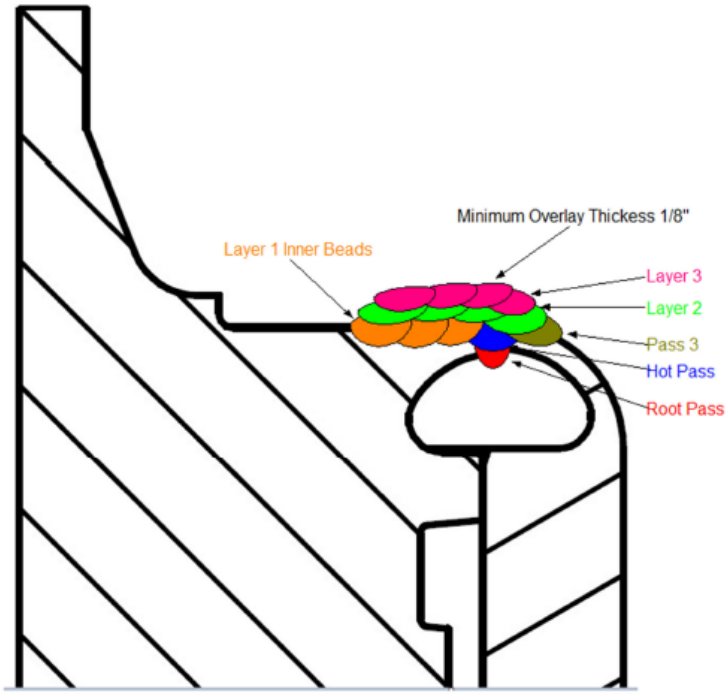

Figure 3: St. Lucie Unit 2 CEDM Middle Canopy Seal Weld Modified with Weld Overlay

CSTL2-CR020-TR-CF-000001-NP, Revision 2

St. Lucie Unit 2 CEDM Canopy Seal Weld Overlay Repair

January 13, 2022

Author: Gordon Z. Hall*, Structural Design & Analysis

Verifier: B. Reddy Ganta*, Structural Design & Analysis

Manager: Stephen P. Rigby*, Structural Design & Analysis

**Electronically approved records are authenticated in the electronic document management system.*

Forward

This document contains Westinghouse Electric Company LLC proprietary information and data which has been identified by brackets. Coding (a,c,e) associated with the brackets sets forth information which is considered proprietary.

The proprietary information and data contained within the brackets in this report were obtained at considerable Westinghouse expense and its release could seriously affect our competitive position. This information is to be withheld from public disclosure in accordance with the Rules of Practice 10 CFR 2.390 and the information presented herein is safeguarded in accordance with 10 CFR 2.390. Withholding of this information does not adversely affect the public interest.

This information has been provided for your internal use only and should not be released to persons or organizations outside the Directorate of Regulation and the Advisory Committee on Reactor Safeguards (ACRS) without the express written approval of Westinghouse Electric Company LLC. Should it become necessary to release this information to such persons as part of the review procedure, please contact Westinghouse Electric Company LLC, which will make the necessary arrangements required to protect the Company's proprietary interests.

Several locations in this topical report contain proprietary information. Proprietary information is identified and bracketed. For each of the bracketed locations, the reason for the proprietary classification is provided, using a standardized system. The proprietary brackets are labeled with three (3) different letters, "a", "c", and "e" which stand for:

a. The information reveals the distinguishing aspects of a process or component, structure, tool, method, etc. The prevention of its use by Westinghouse's competitors, without license from Westinghouse, gives Westinghouse a competitive economic advantage.

c. The information, if used by a competitor, would reduce the competitor's expenditure of resources or improve the competitor's advantage in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

e. The information reveals aspects of past, present, or future Westinghouse- or customer-funded development plans and programs of potential commercial value to Westinghouse.

1.0 Background and Purpose

Approximately 1200 EST on January 6, 2022, St. Lucie Unit 2 informed Westinghouse of a control element drive mechanism (CEDM) rod slip on control element assembly (CEA) #27 while withdrawing to 120 steps for quarterly exercises. After the rod slipping, steps were attempted, and no motion was seen. The plant went through extensive troubleshooting of potential electrical causes to no effect. The decision was made to proceed to Mode 5 and replace the CEDM motor. The upper pressure housing and motor housing will be reused. Figure 1-1 illustrates the CEDM-shroud assembly. The upper/motor housing canopy seal will be cut and reweld for the motor replacement. Due to ease of implementation, a structural weld overlay (WOL) process will be performed as a replacement for the existing canopy seal weld.

Although no leak or flaw was detected in the canopy seal weld, a postulated through-wall flaw is assumed in the existing canopy seal weld for the design of the WOL. The WOL repair designed under the requirements of ASME Section XI, 2007 Edition with 2008 Addendum [2], Paragraph IWB-3640, "Evaluation Procedures and Acceptance Criteria for Flaws in Austenitic and Ferritic Piping," and Appendix C, "Evaluation of Flaws in Piping," will be used as an alternative repair method. Guidance is also taken from ASME Code Case N-504-4 [3] which was incorporated into ASME Section XI Article Q [2], and NUREG-0313 [4].

Revision 1 of this letter report addresses customer comments. All calculations and results remain unchanged. All changes are marked with change bars.

Revision 2 of this letter report adds Appendix A for responses to NRC draft request for additional information (RAI) questions numbers 1 through 4. The RAI responses are also incorporated into the body of this letter report. All changes are marked with change bars.

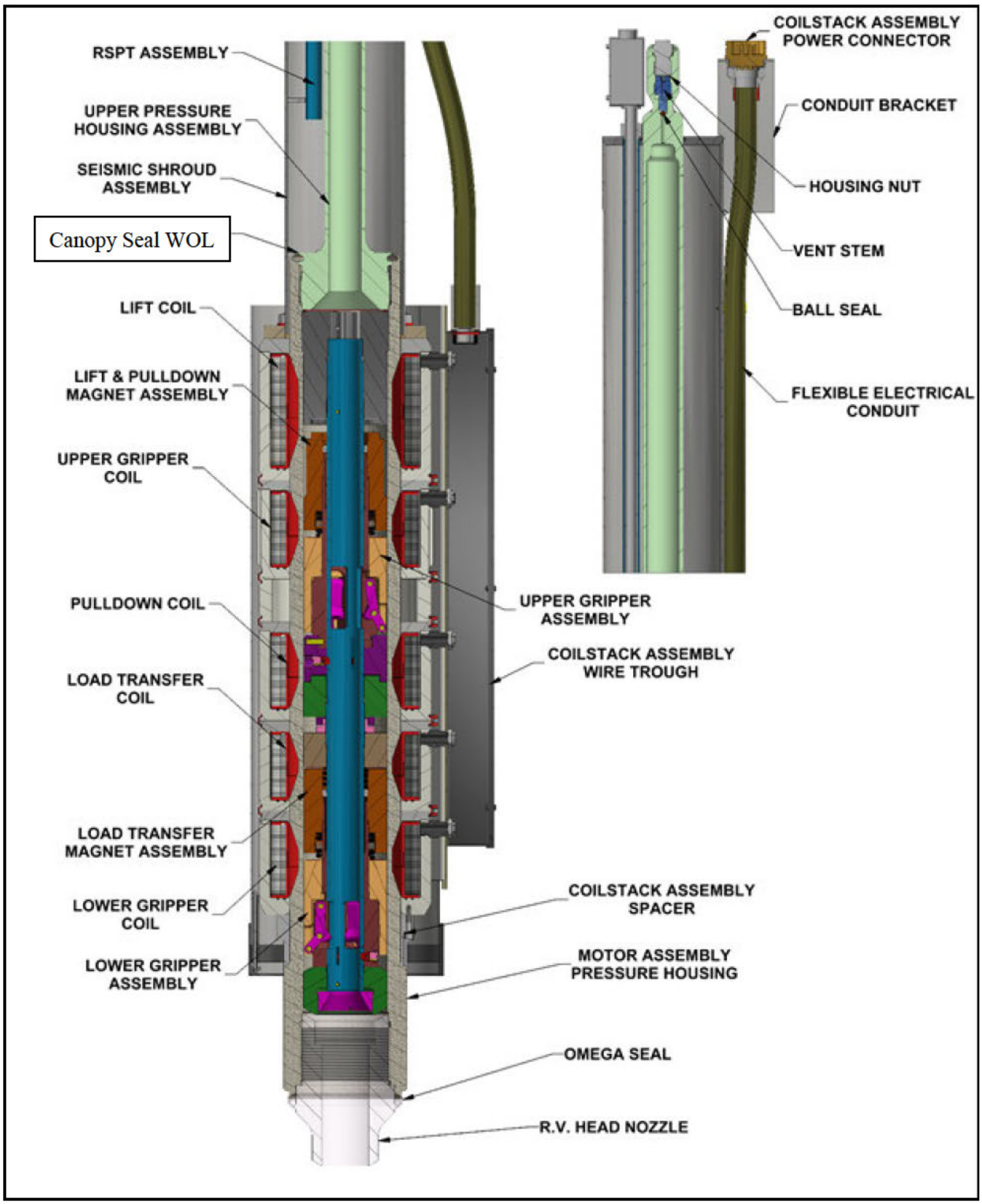

Figure 1-1: Control Element Drive Mechanism-Shroud Assembly Illustration

2.0 Method Discussion

Analyses of record (AOR) for the St. Lucie Unit 2 CEDM is design report, DAR-CI-05-14 [5]. The CEDM upper/motor housing canopy seal weld stresses from the AOR are scaled for the post-WOL canopy seal geometry and used for the stress and fracture mechanics evaluation. Both stress corrosion cracking (SCC) and fatigue crack growth mechanisms are considered.

3.0 Acceptance Criteria

IWB-3640 and Appendix C of the 2007 with 2008 Addendum Edition of ASME Section XI [2] will be used to perform the required fracture mechanics evaluation and to design a weld overlay repair of the postulated flawed canopy seal weld. Portions of Code Case N-504-4 [3] are also used for guidance. Code Case N-504-4 allows repair by addition of weld material without removal of the underlying defect to be considered as a code repair. The Code Case N-504-4 is endorsed by the NRC in Regulatory Guide 1.147 [6] and incorporated into Article Q of 2007 with 2008 Addendum Edition of ASME Section XI [2].

IWB-3640 of [2] provides criteria for acceptance of flaws without repair in ductile, austenitic materials. The basis for such acceptance is the evaluation of the structural adequacy of the flawed component after considering the predicted flaw growth over the evaluation period. The acceptance criteria are based upon the net section collapse (limit load) criteria which are defined in detail in Appendix C of Section XI. Also, NUREG-0313, Revision 2 [4] is used for guidance. The use of NUREG-0313 will result in the repair design of the canopy seal weld to be based upon conservative treatment of applied stresses, and includes allowance for continued flaw growth, as required by Section XI.

4.0 Input

Geometric Input

The St. Lucie Unit 2 CEDM drawings are listed in [7]. The upper pressure housing and motor housing canopy seal is illustrated in the CEDM installation drawing, sheet 2 of E-13172-163-004 [7.a] and reproduced in Figure 4-1.

a,c,e

Figure 4-1: Upper/Motor Housing Canopy Seal Weld [7.a]

The weld overlay on the canopy seal weld is illustrated in Figure 4-2. The weld overlay thickness is 0.125” minimum.

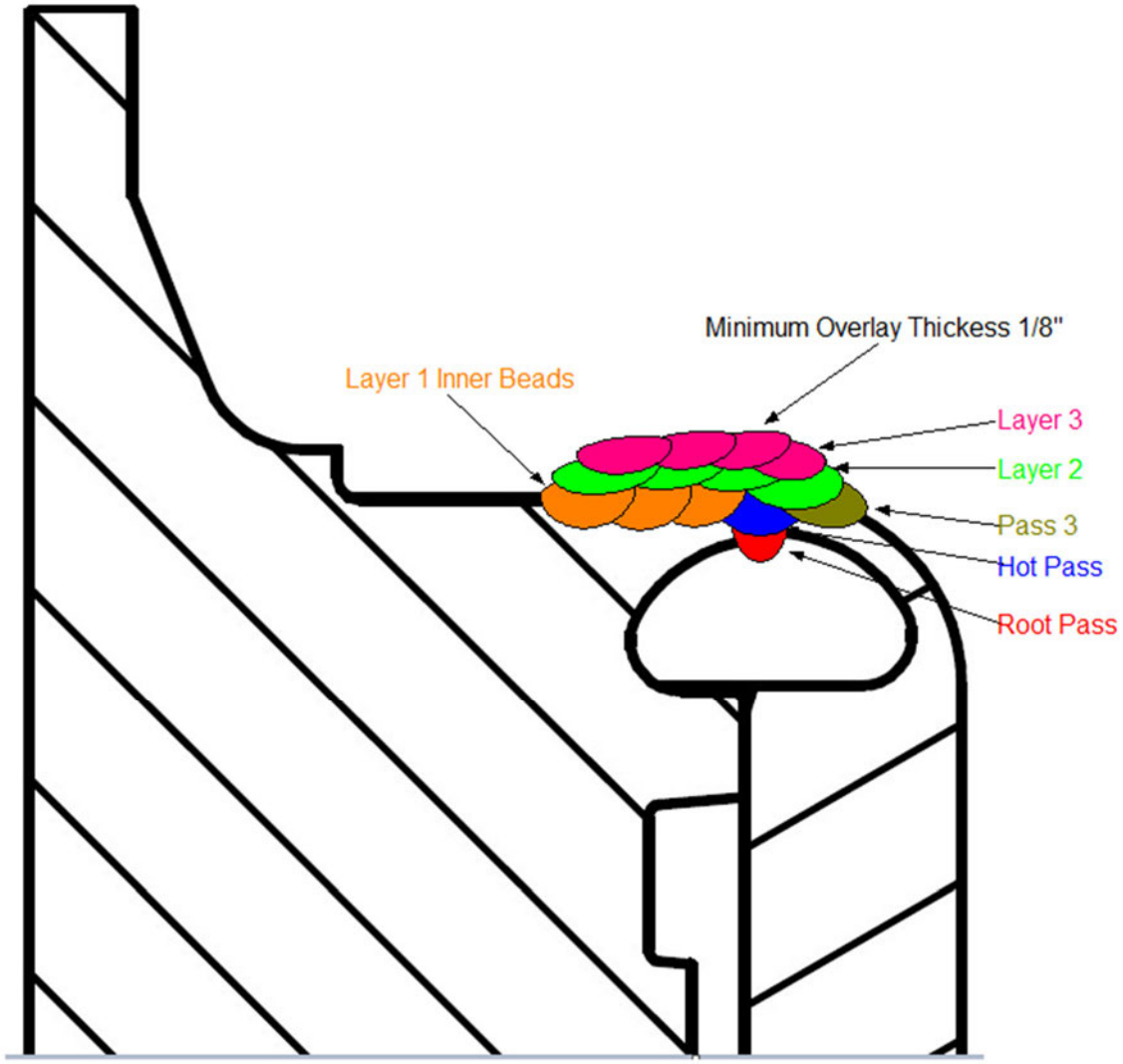

Figure 4-2: Canopy Seal Weld Overlay Design Sketch

5.0 Canopy Seal Stress Calculations

As discussed in the AOR of the CEDM [5], per ASME Section III, NB-3227.7, welded seals such as the CEDM canopy seals are only subjected to general primary membrane stress (P_m) requirements due to internal pressure loading. All other membrane and bending stress intensity developed in the welded seal may be considered as secondary stress intensity. Therefore, only pressure induced P_m is considered for the canopy seal weld and WOL section. The primary membrane stresses are calculated using the formulas from Table 32, Case 1b of [10], which are applicable to a thick-walled pressure vessel. This simplified method doesn't necessarily yield accurate stresses in the canopy seal and weld overlay, but is reasonable for the purpose of comparing the strength of the weld overlay to the strength of the canopy seal.

Input for Stress Calculations

Design Temperature: 650 °F Per paragraph 4.2.2 of [8]

Design Pressure: 2.5 ksi Per paragraph 4.2.2 of [8]

Per the drawing in [7.a] and AOR [5], the upper pressure housing is made of SA-182 F348; the motor housing is made of SA-479 TP 316. The limiting value of design allowable, S_m is used for the upper/motor housing canopy seal weld.

Design Stress Allowable, S_m for the canopy seal weld: [ ]^{a,c,e} ksi [5, 9]

Original canopy seal dimensions:

Inner radius, [ ]^{a,c,e}

Thickness, [ ]^{a,c,e}

Outer radius, [ ]^{a,c,e}

Weld Overlay Dimensions

Inner radius, [ ]^{a,c,e}

Thickness, [ ]^{a,c,e}

Outer radius, [ ]^{a,c,e}

Primary Stresses for the Original Canopy Seal:

[ ] a,c,e

Primary Stresses for the Weld Overlay Only:

[a,c,e]

The primary stresses in the weld overlay, conservatively calculated without any support from the original canopy seal, are less than the primary stresses calculated in the original canopy seal. Therefore, the primary stresses in DAR-CI-05-147, Rev. 4 [5], can be conservatively applied to the weld overlay.

Primary Stresses for the combined Canopy Seal and Weld Overlay:

[a,c,e]

Weld Overlay Thermal Stresses

Historically, analyses have shown insignificant temperature variation across the thickness of the canopy seals. The water inside the canopy seal is stagnant, any change of the reactor coolant temperature is transmitted by means of conduction through the upper and motor housings to the canopy seal. Therefore, the through-wall temperature of the canopy seal is quite uniform and the thermal stress at the canopy seal and overlay is negligible.

Weld Overlay Filler Material

The filler metal originally used for construction to join the SA-479 316 to SA-182 F348 was ER316L. The filler metal which will be used for the overlay and weld metal support in the seal weld groove is ER308/308L. Using ER308/308L filler metal compositionally is similar to ER316L. Both filler metals are nominally in the same family of alloys, 20Cr – 10Ni alloys, which result in an austenitic weld metal with comparable ferrite values. The resultant weld using either ER308/308L or ER316L when joining the SA-479 316 to SA-182 F348 base metal will produce ferrite levels of approximately 8 to 11% ferrite. The resultant weld will produce similar corrosion resistance in the presence of reactor water and resistance to stress corrosion cracking.

The ASME design stresses are listed in Table 5-1. The original limiting S_m = 16.7 ksi was used as allowable in the AOR [5]. The S_m for ER308/308L weld filler is slightly lower the AOR. However, the primary stress at the canopy seal weld is reduced due to the added WOL thickness, therefore, the small decrease of S_m allowable has no impact on the ASME Section III primary stress requirement.

Table 5-1: ASME Material Design Stresses at 650°F per [9]

S_y (ksi)	S_m (ksi)	Material	Component
18.5	16.7	SA-479 316	Upper pressure housing
21.1	19.0	SA-182 F348	Motor housing
18.0	16.2	ER308/308L	WOL weld filler

6.0 Stress Corrosion Crack Growth Analysis

An assessment of the repaired canopy seal weld following the WOL is carried out assuming all the original seal wall thickness has cracked. A hypothetical flaw depth equivalent to this original seal wall thickness as the initial flaw depth to estimate the remaining life of the repaired weld under stress corrosion cracking (SCC) followed by fatigue crack growth.

For the estimation of the crack propagation rate, the following equation is used:

$$\frac{da}{dt} = 2.825\ (10^{-11})K^{3.43}$$

where da/dt is the crack growth rate with time (inches/hour), and

K is the stress intensity factor (ksi√in).

This equation was developed for 316 stainless steel in a boiling water reactor (BWR) normal water chemistry using NUREG-0313, [4], and WCAP-16357-P [11]. Note that the ER308/308L weld filler metal that is selected for this application has a similar level of chrome and nickel content compared to type 316 stainless steel. The aforementioned SCC rate is appropriate for the filler metal. Note also that the BWR environment is more aggressive than the pressurized water reactor (PWR) environment. Cracking in austenitic stainless steels have been by far more frequently observed in BWRs than in PWRs. The SCC growth estimates below are thus conservative.

The stress intensity factor for a crack in the intermediate canopy seal is conservatively estimated based on a circumferential internal surface crack in a cylinder (see Article IV.3.4.5 in R6 Code manual [12]) considering a crack width/depth ratio of 2:

$$K = 0.682\ \sigma\sqrt{\pi\ a}$$

Where a is the crack depth (in)

σ is the stress (ksi)

Here, the hypothetical initial crack depth is through the entire wall of the original seal weld which is 0.09 inch deep which is considered to be conservative. The driving force in stress corrosion cracking is the sustained stress during normal operation, plus the residual stress due to the weld overlay process. The weld residual stresses in the canopy are conservatively taken as equal to the yield strength of the CEDM material. Per design report, DAR-CI-05-14 [5] and drawings [7], the upper pressure housing is made of SA-479 TP 316; the motor housing is made of SA-182 F348. The maximum yield strength of these materials at 650°F is 21.1 ksi per ASME Section II Part D, Table Y-1 [9]. See Table 5-1. The weld residual stress will be conservatively assumed to be 21.1 ksi.

The stresses in the canopy under design conditions are taken from [5]: P_m = [ ]^{a,c,e} ksi. This primary stress level has to be factored down to account for the overlay. The Section 5.0 closed-form solutions for the pre- and post-WOL canopy seal weld pressure stresses are used to scale the P_m. For the longitudinal stress, the pre-WOL/post-WOL scale factor is [ ]^{a,c,e} = 0.364. For the maximum circumferential stress, the pre-WOL/post-WOL scale factor is [ ]^{a,c,e} = 0.499. The limiting factor of 0.499 is used to scale the post-WOL stress. The total stress (that includes yield stress at 650°F) is [ ]^{a,c,e} ksi. Considering design conditions in place of normal operating condition is a conservative assumption. Hence, the stress intensity factor is:

[ ]a,c,e

The initial crack propagation rate is then:

[ ] a,c,e

This rate is equal to [ ]a,c,e, which is not significant with respect to the weld overlay thickness of 0.125 inch .

This equation has been integrated for a 60-year evaluation period, giving an increase in K from [ ]a,c,e. The final crack depth due to 60 years of SCC, starting from the January 2022 WOL installation, is 0.1463 inch. Results are summarized in Table 6-1.

Table 6-1: Stress Corrosion Crack Growth Results a,c,e

[ ]

7.0 Fatigue Crack Growth Performance

Fatigue crack growth is conservatively estimated using a stress intensity range $3*S_m$ for P_m+P_b+Q, maximum allowed by the ASME Code.

The results from DAR-CI-05-14, Rev. 4, Table 1 [5] showed that in the initial configuration the calculated $P_m + P_b + Q$ stress in the canopy seal weld is [ ]^{a,c,e}. The ASME Code allowable of $3*S_m$ is 50.1 ksi. This large range is applicable to the transients with the largest pressure and temperature variations and is likely related to an event with a limited number of occurrences. The weld overlay repair will significantly decrease this stress, so that our assumption is conservative. The detailed design analyses performed for the lower canopies and documented in WCAP-16357-P, [11], as well as similar canopy seal WOL analyses for other plants confirm this assumption.

The stress intensity factor is calculated as discussed in the previous section.

[ ] a,c,e

Using Figure C-8410-1 of [2] (see Figure 7-1), the fatigue crack growth rate for austenitic stainless steel in air environments is taken conservatively at $2.4*10^{-5}$ in/cycle for R=0.9 (assuming a high mean stress to account for the weld residual stresses) and at 550°F. A factor of 2 is then used to account for the water environment. For the sake of this evaluation, it is assumed that 200 occurrences of this stress range occur over a life of 60 years of the plant.

The total propagation of the crack is: [ ]^{a,c,e}, which is not significant in comparison with the thickness of the weld overlay thickness of 0.125 inch.

Figure C-8410-1
Reference Fatigue Crack Growth Curves for Austenitic Stainless Steels in Air Environments

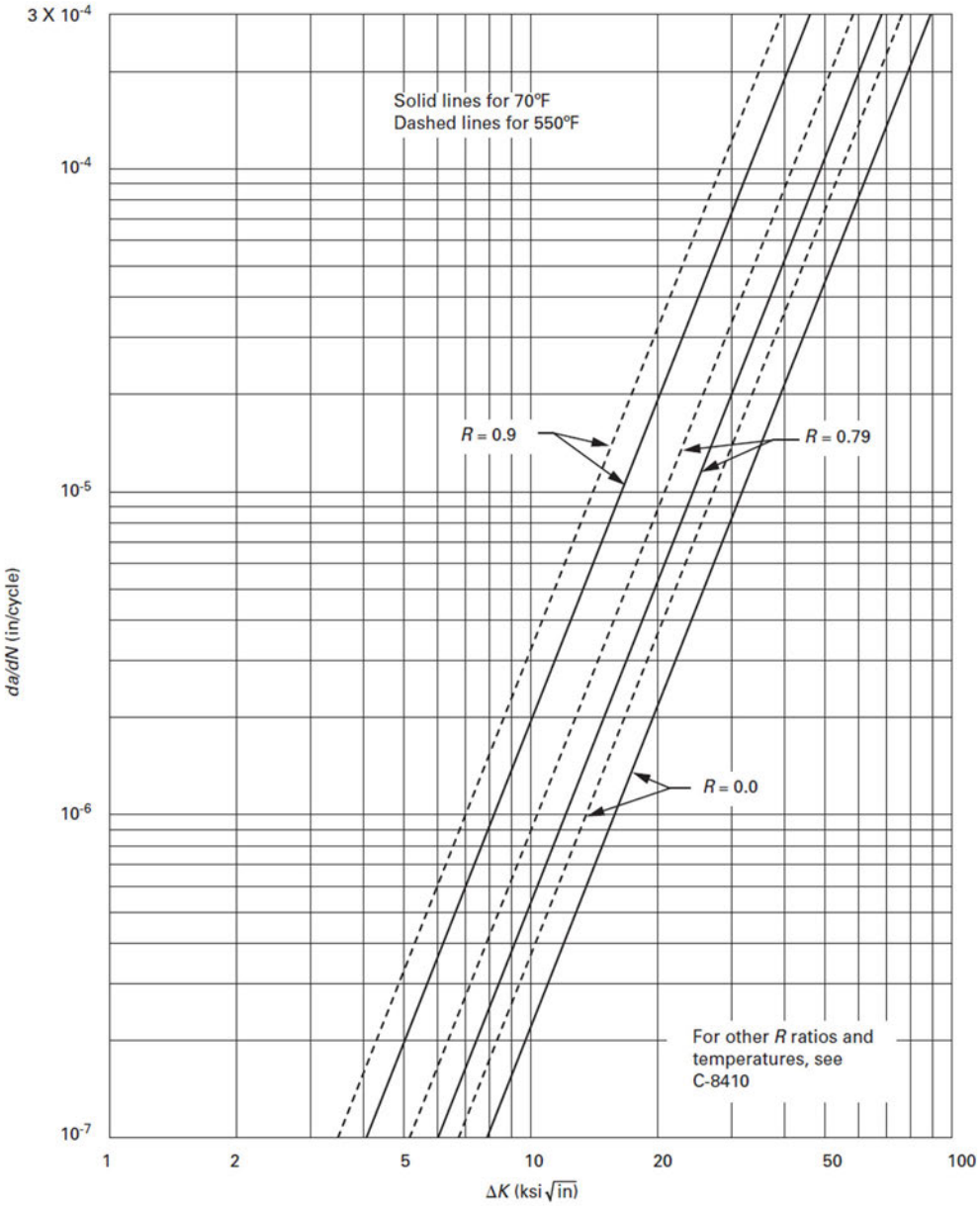

Figure 7-1: ASME Section XI Fatigue Crack Growth Curve, [2]

8.0 Summary and Conclusion

In this report, the impact of the mid-canopy seal weld overlay has been assessed. The following topics have been addressed:

- Primary and thermal stresses in a weld overlay with a minimum thickness of 0.125 inch are less than the primary and thermal stresses in a canopy seal. Therefore, the stresses calculated in design report DAR-CI-05-14 [5], are conservatively applicable to a minimum 0.125-inch thick weld overlay, and thus the Section III ASME Code [9], criteria are met by the weld overlay.
- A stress corrosion performance evaluation has been carried out. An initial propagation rate of [ ]^{a,c,e} for an initial flaw depth of 0.090 inch has been calculated, which is not significant in comparison with the weld overlay thickness of 0.125 inch. The final corrosion crack depth for 60 years after the WOL installation has been evaluated to be [ ]^{a,c,e}.
- A fatigue crack growth evaluation has been carried out. A propagation of [ ]^{a,c,e} has been calculated assuming an initial flaw depth of [ ]^{a,c,e} and 200 full thermal cycles of a stress range equal to $3*S_m$, which is not significant in comparison with the weld overlay thickness of 0.125 inch.

Both crack propagation assessments ensure the compliance with the provisions from ASME Section XI, IWB-3640 [2], i.e., the final flaw depth of 0.156 in, 73.6% of the 0.215 inch post-WOL canopy seal thickness, which is less than the 75% wall thickness limit. The results are summarized in Table 8-1. In conclusion the design of the weld overlay is acceptable.

Table 8-1: Summary of Flaw Evaluation

[ ]^{a,c,e}

9.0 References

1. Westinghouse Calculation Note, CSTL2-CR020-CN-CF-000001, Rev. 0, “St. Lucie Unit 2 CEDM Canopy Seal Weld Overlay Repair Contingency,” January 10, 2022.
2. ASME Boiler and Pressure Vessel Code, Section XI, “Rules for Inservice Inspection of Nuclear Power Plant Components,” 2007 Edition with 2008 Addendum.
3. ASME Boiler and Pressure Vessel Code, Code Case N-504-4, “Alternative Rules for Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping,” July 14, 2006.
4. U.S. Nuclear Regulatory Commission NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping, " January 1988.
5. Westinghouse Engineering Memorandum, DAR-CI-05-14, Rev. 4, “St. Lucie Unit 2 Control Element Drive Mechanism (CEDM) Stress Report Addendum,” May 12, 2009.
6. U.S. Nuclear Regulatory Commission Regulatory Guide 1.147, Revision 19, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," October 2019.
7. Westinghouse Drawings
    a. E-13172-163-004, Rev. 07, “CEDM Installation DWG”.
    b. SCEDM-163-114, Rev. 03, “Motor Housing Assy St. Lucie 2”.
    c. SCEDM-163-103, Rev. 07, “Upper Pressure Housing Assembly”.
8. Westinghouse Design Specification, 13172-RCE-0311, Rev. 05, “Project Design Specification for Control Element Drive Mechanisms for Florida Power & Light Company St. Lucie Unit 2,” March 5, 2009.
9. ASME Boiler and Pressure Vessel Code, Section II and III, 1998 Edition through 2000 Addenda.
10. Roark, Raymond J. and Young, Warren C., “Formulas for Stress and Strain,” Fifth Edition, McGraw-Hill Inc., New York, NY, 1975.
11. Westinghouse Report, WCAP-16357-P, Rev. 0, “Evaluation of CRDM Lower Canopy Seal Weld Overlay Repair: Seabrook Nuclear Power Station Unit 1,” October 2004.
12. R6 Procedure, Rev. 4, “Assessment of the integrity of structures containing defects,” 2000.

Appendix A: Draft RAI Responses

U.S. Nuclear Regulatory Commission (USNRC) issued a draft request for additional information (RAI) to Florida Power & Light Company (FPL) on January 13, 2022. This appendix provides responses to RAIs 1 through 4. FPL will respond to RAI 5.

Draft
Request for Additional Information
Relief Request Number 20
Alternate Examination of Canopy Seal Weld
Control Element Drive Mechanism Number 27 Housing
St Lucie Nuclear Plant, Unit 2
Florida Power and Light Company
Docket No. 50-389

By letter dated January 12, 2022, (Agencywide Documents and Access Management System (ADAMS) Accession No. ML22012A139), Florida Power and Light Company request relief from examination requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, at St Lucie Nuclear Plant, Unit 2.

In accordance with Title 10, Code of Federal Regulations, 10 CFR 50.55a, "Codes and standards," paragraph (z)(2), the licensee submitted for Nuclear Regulatory Commission (NRC) review and approval of Relief Request Number 20. The proposed relief request is related to the alternate repair of the canopy seal weld associated with the control element drive mechanism Number 27 housing.

NRC staff has determined that additional information is needed to complete the review, as indicated in the requests for additional information (RAIs) below.

RAI 1
The licensee analyzed the weld overlay and canopy seal based on the design pressure only. NRC staff is of the impression that the licensee did not include deadweight and seismic loads in its stress analysis. The NRC staff understands that the weld overlay is not a structural weld and its purpose is to prevent leakage. (1) Discuss why the deadweight and seismic loads were not included in the stress analysis. (2) Based on Figure 1-1 of the Westinghouse calculation CSTL2-CR020-TR-CF-000001-P, Revision 1, discuss whether there are other tensile forces that should be considered in the stress analysis of the weld overlay such as tensile forces that would pull apart the weld overlay from the housing during the control rod movements.

Westinghouse Response

(1) Per ASME Section III, NB-3227.7, welded seals such as omega and canopy seals are only subjected to general primary membrane (P_m) stress requirements due to pressure. All other membrane and bending stress intensity developed in the weld seal may be considered as secondary stress intensity. Therefore, only pressure induced P_m is considered for the canopy seal weld and WOL section. For the fatigue crack growth analysis, a conservative, ASME limit of $3S_m$ value was used which exceeds the primary plus secondary stress reported in the analysis of record (AOR).

(2) Based on the AOR, the primary stress in the canopy seal is the membrane stress due to internal pressure. The purpose of the canopy seal is to prevent leakage. There is no other primary stress at the canopy seal. The pressure induced primary membrane stress is the only requirement per NB-3227.7.

RAI 2

Figure 3 of the relief request and Figure 4-2 of the Westinghouse calculation CSTL2-CR020-TR-CF-000001-P, Revision 1 show the design of the weld overlay. Page 7 of the Westinghouse calculation CSTL2-CR020-TR-CF-000001-P, Revision 1 shows the primary stress of combined weld overlay and canopy seal weld. However, Section 6, page 10 of the Westinghouse calculation states that the wall thickness of the canopy seal weld is assumed to be completely cracked when performing the stress corrosion crack growth analysis. If the canopy seal weld is assumed to be completely cracked in Section 6, explain the technical basis of including the wall thickness of the canopy seal weld in the primary stress calculation on page 7 of the calculation.

Westinghouse Response

The stress corrosion crack (SCC) and fatigue crack growth analysis conservatively assumed a postulated flaw of the original seal weld thickness. It is a conservative and hypothetical scenario. The weld overlay design does not have any flaw at this location.

RAI 3

Section 5, first paragraph, of the relief request states that the enhanced remote visual examination will be performed per IWA-2211-1 of the ASME Code, Section XI. Discuss the acceptance criteria that will be used to disposition any potential indications.

Westinghouse Response

(1) This weld repair is governed by ASME Section III NB-5271 Welded Joints of Specially Designed Seals which require a liquid penetrant examination method.

(2) Since the weld repair condition prevents accessibility for the liquid penetrant examination, we opted to perform an enhanced remote visual examination with a minimum of 5X magnification.

(3) We considered the visual weld acceptance standards from PCI GQP 9.6, limiting weld surface conditions and allowing [ ]^{a,c,e} provides acceptability comparable to the NB 5352 Acceptance Standards.

RAI 4

Last paragraph, page 10 of the Westinghouse calculation CSTL2-CR020-TR-CF-000001-P, Revision 1 states that a calculated factor of 0.499 is used. Discuss how 0.499 is derived.

Westinghouse Response

The closed form longitudinal stress for the pre-WOL canopy seal weld is [ ]^{a,c,e}; post-WOL seal weld is stress [ ]^{a,c,e}. The factor is [ ]^{a,c,e} = 0.364.

The closed form maximum circumferential stress for the pre-WOL canopy seal weld is [ ]^{a,c,e}; post-WOL seal weld stress is [ ]^{a,c,e}. The factor is [ ]^{a,c,e} = 0.499.

The more limiting factor of 0.499 is used to scale the post-WOL stress using exiting Pm from analysis of record.

RAI 5
Section 6 of the proposed alternative states:

> As previously stated, the canopy seal weld overlay serves as a secondary leakage barrier and serves no structural function, as the full structural load is still carried by the threaded connection in accordance with the original CEDM housing design. There is no applicable ASME Code Section XI, Examination Category or Item Number associated with this configuration as canopy seal welds are not subject to Table IWB-2500-1 surface or volumetric examinations. The design life of the canopy seal weld overlay includes a postulated through wall flaw of the existing canopy seal weld and fatigue and corrosion crack growth analyses that support 60 years of service from the time of installation, well beyond the current license. Leak integrity is monitored during operation as discussed above and periodic boric acid walkdown of the reactor vessel head region during refueling outages will confirm leak integrity is maintained.
>
> Therefore, the proposed alternative is for the remainder of the life of the plant.

Proposed alternatives for repairs performed in accordance with ASME Code Section XI are considered applicable for the current 10-year ISI interval of a plant unless expressly stated otherwise. Although it is understood that a repair is acceptable for the life of the design of the repair, the proposed alternative is granted for the current interval. The provisions of the relief request are applicable to the current interval only. The NRC staff requests that the licensee modify the application accordingly.

Note that Florida Power and Light Company will respond to RAI 5.

Westinghouse Non-Proprietary Class 3

AFFIDAVIT CAW-22-003

Commonwealth of Pennsylvania:
County of Butler:

(1) I, Camille Zozula, Manager, Regulatory Compliance and Corporate Licensing, have been specifically delegated and authorized to apply for withholding and execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse).

(2) I am requesting the proprietary portions of CSTL2-CR020-TR-CF-000001-P Rev 2 be withheld from public disclosure under 10 CFR 2.390.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged, or as confidential commercial or financial information.

(4) Pursuant to 10 CFR 2.390, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse and is not customarily disclosed to the public.

(ii) The information sought to be withheld is being transmitted to the Commission in confidence and, to Westinghouse's knowledge, is not available in public sources.

(iii) Westinghouse notes that a showing of substantial harm is no longer an applicable criterion for analyzing whether a document should be withheld from public disclosure. Nevertheless, public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar technical evaluation justifications and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

(5) Westinghouse has policies in place to identify proprietary information. Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage (e.g., by optimization or improved marketability).

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(6) The attached documents are bracketed and marked to indicate the bases for withholding. The justification for withholding is indicated in both versions by means of lower-case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower-case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (5)(a) through (f) of this Affidavit.

I declare that the averments of fact set forth in this Affidavit are true and correct to the best of my knowledge, information, and belief. I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 1/13/2022

Signed electronically by
Camille Zozula
Regulatory Compliance &
Corporate Licensing