



L-2024-004  
10 CFR 55a(z)(2)  
January 18, 2024

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

RE: St. Lucie Nuclear Plant Unit 1  
Docket No. 50- 335  
Renewed Facility Operating License DPR-67

Relief Request (RR)#7, Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1), Extension of Inspection Interval for St. Lucie Unit 1 Reactor Pressure Vessel Welds from 10 to 20 Years

Pursuant to 10 CFR 50.55a(z)(1), Florida Power & Light Company (FPL) requests relief from the reactor pressure vessel (RPV) examination requirements of American Society of Mechanical Engineers (ASME), Section XI, Subsection IWB-2411, "Inspection Program", for St. Lucie Nuclear Plant (St. Lucie) Unit 1. The proposed alternative would extend the RPV volumetric examination requirements for Examination Categories B-A and B-D welds from once each 10-year inservice inspection (ISI) interval to once every twenty years. FPL satisfactorily completed the Category B-A and B-D RPV examinations at St. Lucie Unit 1 in March 2018. FPL proposes to perform the next Category B-A and B-D exams by no later than 2037.

The enclosure to this letter provides FPL's evaluation of proposed alternative. The evaluation demonstrates that the proposed alternative provides an acceptable level of quality and safety using the methodology described in WCAP-16168-NP-A, Revision 3, "Risk-Informed Extension of the Reactor Vessel In-service Inspection Interval" (ADAMS Accession No. ML11306A084). Nuclear Regulatory Commission approval of the proposed alternative is requested within one year of this submittal.

This letter contains no new regulatory commitments.

Should you have any questions regarding this submission, please contact Mr. Kenneth Mack, Fleet Licensing Manager, at 561-904-3635.

Sincerely,

A handwritten signature in black ink, appearing to read 'D. Strand', is written over a horizontal line.

Dianne Strand  
General Manager, Regulatory Affairs  
Florida Power & Light Company

Enclosure

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  
Mr. Clark Eldredge, Florida Department of Health

**Relief Request Number RR#7**  
**Extension of St. Lucie Unit 1 RPV Welds from 10 to 20 Years**

Proposed Alternative  
In Accordance with 10 CFR 50.55a(z)(1)

-Alternative Provides Acceptable Level of Quality and Safety-

**1. ASME Code Component(s) Affected**

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

Category B-A welds are defined as “Pressure Retaining Welds in Reactor Vessel.”

Category B-D welds are defined as “Full Penetration Welded Nozzles in Vessels.”

Examination Category	Item No.	Description
B-A	B1.10	Shell Welds
B-A	B1.11	Circumferential Shell Welds
B-A	B1.12	Longitudinal Shell Welds
B-A	B1.20	Head Welds
B-A	B1.21	Circumferential Head Welds
B-A	B1.22	Meridional Head Welds
B-A	B1.30	Shell-to-Flange Weld
B-D	B3.90	Nozzle-to-Vessel Welds
B-D	B3.100	Nozzle Inside Radius Section

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

**2. Applicable Code Edition and Addenda**

ASME Code Section XI, “Rules for Inservice Inspection of Nuclear Power Plant Components,” 2007 Edition through 2008 Addenda (Reference 1).

**3. Applicable Code Requirement**

IWB-2411, Inspection Program, requires volumetric examination of essentially 100% of reactor vessel pressure-retaining welds identified in Table IWB-2500-1 once each 10-year interval. The fourth 10-year inservice inspection (ISI) interval for St. Lucie Unit 1 is scheduled to end on February 10, 2028. The applicable Code for the fifth 10-year ISI interval will be selected in accordance with the requirements of 10 CFR 50.55a.

**4. Reason for Request**

An alternative is requested from the requirement of the IWB-2411 Inspection Program, that volumetric examination of essentially 100% of reactor vessel pressure-retaining Examination Category B-A and B-D welds be performed once each 10-year interval. Extension of the interval between examinations of Category B-A and B-D welds from 10 years to up to 20 years will result in a reduction in man-rem exposure and examination costs.

**5. Proposed Alternative and Basis for Use**

FPL proposes not to perform the ASME Code required volumetric examination of the St. Lucie Unit 1 reactor vessel full penetration pressure-retaining Examination Category B-A and B-D welds for the fifth inservice inspection, currently scheduled for 2025. FPL will perform the fifth ASME Code required volumetric examination of the St. Lucie Unit 1 reactor vessel full penetration pressure-retaining Examination Category B-A and B-D welds in the sixth inservice inspection interval in 2037. The proposed inspection date is consistent with the latest revised implementation plan, OG-10-238 (Reference 2).

In accordance with 10 CFR 50.55a(z)(1), an alternate inspection interval is requested on the basis that the current interval can be revised with negligible change in risk by satisfying the risk criteria specified in Regulatory Guide 1.174 (Reference 3).

The methodology used to conduct this analysis is based on that defined in the study WCAP-16168-NP-A, Revision 3, "Risk-Informed Extension of the Reactor Vessel In-service Inspection Interval" (Reference 4). This study focuses on risk assessments of materials within the beltline and extended beltline regions of the RV wall. The results of the calculations for St. Lucie Unit 1 were compared to those obtained from the Combustion Engineering (CE) pilot plant evaluated in WCAP-16168-NP-A, Revision 3. Appendix A of the WCAP identifies the parameters to be compared. Demonstrating that the parameters for St. Lucie Unit 1 are bounded by the results of the CE pilot plant qualifies St. Lucie Unit 1 for an ISI interval extension.

Table 1 below lists the critical parameters investigated in the WCAP and compares the results of the Westinghouse pilot plant to those of St. Lucie Unit 1. Tables 2 and 3 provide additional information that was requested by the NRC and included in Appendix A of Reference 4.

<b>Table 1 Critical Parameters for the Application of Bounding Analysis for St. Lucie Unit 1</b>			
<b>Parameter</b>	<b>Pilot Plant Basis</b>	<b>Plant-Specific Basis</b>	<b>Additional Evaluation Required?</b>
Dominant Pressurized Thermal Shock (PTS) Transients in the NRC PTS Risk Study are Applicable	NRC PTS Risk Study (Reference 5)	PTS Generalization Study (Reference 6)	No
Through-Wall Cracking Frequency (TWCF)	3.16E-07 Events per year (Reference 4)	4.45E-8 Events per year (Calculated per Reference 4)	No
Frequency and Severity of Design Basis Transients	13 heatup/cooldown cycles per year (Reference 4)	Bounded by 13 heatup/cooldown cycles per year	No
Cladding Layers (Single/Multiple)	Single Layer (Reference 4)	Single Layer	No

Table 2 below provides a summary of the latest reactor vessel inspection for St. Lucie Unit 1 and an evaluation of the recorded indications. This information confirms that satisfactory examinations have been performed on the St. Lucie Unit 1 reactor vessel.

<b>Table 2 Additional Information Pertaining to Reactor Vessel Inspection for St. Lucie Unit 1</b>	
Inspection methodology:	The latest RV ISI for St. Lucie Unit 1 was conducted in accordance with the requirements of Appendix VIII of the ASME Code, Section XI, 1995 Edition with Editions and Addenda through 2000, as modified by the Performance Demonstration Initiative program and 10 CFR 50.55a(b)(2)(xiv, xv, and xvi). Evaluation of recordable indications was performed to the acceptance standards of Section XI, 2001 Edition with Addenda 2003 Addenda. Future inservice inspections will be performed to ASME Section XI, Appendix VIII requirements.
Number of past inspections:	Four 10-Year inservice inspections and a preservice inspection have been performed (1983, 1996, 2008, and 2018).

Number of indications found:	<p>There were forty-one total indications identified in the beltline and extended beltline regions during the most recently completed inservice inspection. These subsurface indications are located in the upper-to-intermediate shell circumferential weld seam (Item 10 in Table 3), the intermediate-to-lower shell circumferential weld seam (Item 11 in Table 3), and the longitudinal weld seams in the upper shell, intermediate shell, and lower shell (Items 12, 17, 18, and 19 in Table 3). All forty-one indications are acceptable per Table IWB-3510-1 of Section XI of the ASME Code. Of the forty-one indications, there are nine indications within the inner 1/10th or inner 1" of the reactor vessel wall thickness. The nine indications are acceptable per the requirements of the Alternate PTS Rule, 10 CFR 50.61a (Reference 7).</p> <p>The fourth 10-year inspection was the first ISI examination that detected the nine indications described above. There is no site-specific flaw growth data since these indications were evaluated as acceptable per ASME Section XI Table IWB-3510-1 and are indicative of fabrication flaws typical of small slag inclusions.</p> <p>A disposition of the nine flaws against the limits of the Alternate PTS Rule is shown in the table below. Four flaws were located in the weld materials and five flaws were located in the plate material. For the four flaws in the weld materials:</p>			
	Through-Wall Extent, TWE (in)		Scaled Maximum number of flaws per 1,572 inches of weld length in the inspection volume that are greater than or equal to $TWE_{MIN}$ and less than $TWE_{MAX}$ .	Number of St. Lucie Unit 1 Flaws Evaluated (Axial/Circ.)
	$TWE_{MIN}$	$TWE_{MAX}$		
	0	0.075	No Limit	0
	0.075	0.475	262	4 (4/0)
	0.125	0.475	142	3 (3/0)
	0.175	0.475	35	1 (1/0)
	0.225	0.475	13	0
	0.275	0.475	6	0
	0.325	0.475	4	0
	0.375	0.475	2	0
	0.425	0.475	1	0
	0.475	Infinite	0	0

**Table 2:  
Additional Information Pertaining to Reactor Vessel Inspection for St. Lucie Unit 1**

For the five flaws in the plate material:

Through-Wall Extent, TWE in.)		Scaled Maximum number of flaws per 13,889 square-inches of inside surface area in the inspection volume that are greater than or equal to $TWE_{MIN}$ and less than $TWE_{MAX}$ .	Number of St. Lucie Unit 1 Flaws Evaluated (Axial/Circ.)
$TWE_{MIN}$	$TWE_{MAX}$		
0	0.075	No Limit	0
0.075	0.375	110	5 (4/1)
0.125	0.375	43	3 (2/1)
0.175	0.375	11	2 (2/0)
0.225	0.375	3	0
0.275	0.375	1	0
0.325	0.375	0	0
0.375	Infinite	0	0

The plant-specific total length (1,572 inches) of reactor vessel beltline welds that were volumetrically inspected and the plant-specific total surface area (13,737 square-inches) of reactor vessel beltline plates that were volumetrically inspected are comprised of the upper-to-intermediate shell circumferential weld, the intermediate-to-lower shell circumferential weld, three longitudinal welds in the intermediate shell, and three longitudinal welds in the lower shell. While the three upper shell longitudinal welds were inspected and evaluated, the length and area associated with these welds are conservatively excluded from the total inspected length and area. Weld length and area were also adjusted based on examination coverage of each weld as this is considered a conservative approach.

Proposed inspection schedule for balance of plant life:

The fifth inservice inspection is scheduled for Fall 2025. This inspection will instead be performed in Spring 2037 plus or minus one refueling outage. The proposed inspection date is consistent with the latest revised implementation plan, OG-10-238 (Reference 2).

Table 3 summarizes the inputs and outputs for the calculation of through-wall cracking frequency (TWCF).

Table 3 Details of TWCF Calculation for St. Lucie Unit 1 at 72 Effective Full Power Years (EFPY)								
Inputs <sup>(1)</sup>								
Inter. & Lower Shell T <sub>wall</sub> [inches]								8.625
Upper Shell T <sub>wall</sub> [inches]:								10.75
No.	Region and Component Description	Material Heat No. Identification	Copper [weight %]	Nickel [weight %]	R.G. 1.99 Position	Chemistry Factor [°F]	RT <sub>NDT(u)</sub> [°F]	Fluence [Neutron/cm <sup>2</sup> , E > 1.0 MeV]
1	Upper Shell Plate C-6-1	A-4516-1	0.16	0.53	1.1	113.10	33	3.01E+18
2	Upper Shell Plate C-6-2	C-5313-2	0.16	0.53	1.1	113.10	15	
3	Upper Shell Plate C-6-3	C-5313-1	0.16	0.53	1.1	113.10	15	
4	Intermediate Shell Plate C-7-1	A-4567-1	0.11	0.64	1.1	74.60	0	6.38E+19
5	Intermediate Shell Plate C-7-2	B-9427-1	0.11	0.64	1.1	74.60	-10	
6	Intermediate Shell Plate C-7-3	A-4567-2	0.11	0.58	1.1	73.80	10	
7	Lower Shell Plate C-8-1	C-5935-1	0.15	0.56	1.1	107.80	20	6.35E+19
8	Lower Shell Plate C-8-2	C-5935-2	0.15	0.57	1.1	108.35	20	
9	Lower Shell Plate C-8-3	C-5935-3	0.12	0.58	1.1	82.60	0	
10	Upper to Intermediate Shell Circumferential Weld Seam 8-203	21935	0.183	0.704	1.1	172.22	-56	3.77E+18
11	Intermediate to Lower Shell Circumferential Weld 9-203	90136	0.27	0.07	1.1	124.25	-60	6.32E+19
12	Upper Shell Axial Weld 1-203 A	21935/12008	0.213	0.867	1.1	208.62	-50	3.77E+18
13	Upper Shell Axial Weld 1-203 B	21935/12008	0.213	0.867	1.1	208.62	-50	3.77E+18
14	Upper Shell Axial Weld 1-203 C	21935/12008	0.213	0.867	1.1	208.62	-50	3.77E+18
15	Intermediate Shell Axial Weld 2-203 A	34B009/ A-8746	0.19	0.09	1.1	90.65	-56	3.91E+19
16	Intermediate Shell Axial Weld 2-203 B	34B009/ A-8746	0.19	0.09	1.1	90.65	-56	2.82E+19



<b>Table 3</b> <b>Details of TWCF Calculation for St. Lucie Unit 1 at 72 Effective Full Power Years (EFPY) (cont.)</b>								
17	Intermediate Shell Axial Weld 2-203 C	34B009/A-8746	0.19	0.09	1.1	90.65	-56	3.78E+19
18	Lower Shell Axial Weld 3-203 A	305424	0.27	0.63	1.1	188.80	-60	2.80E+19
19	Lower Shell Axial Weld 3-203 B	305424	0.27	0.63	1.1	188.80	-60	3.76E+19
20	Lower Shell Axial Weld 3-203 C	305424	0.27	0.63	1.1	188.80	-60	3.88E+19

<b>Outputs</b>							
<b>Methodology Used to Calculate <math>\Delta T_{30}</math>: Regulatory Guide 1.99, Revision 2 (Reference 8)</b>							
	Controlling Material Region No.	$\alpha_{xx}$	$RT_{MAX-XX}$ [°R]	Fluence [Neutron/cm <sup>2</sup> , E > 1.0 MeV]	FF (Fluence Factor)	$\Delta T_{30}$ [°F]	TWCF <sub>95-XX</sub>
Limiting Axial Weld - AW	20	2.3232	654.47	3.88E+19	1.3496	254.80	1.874E-08
Limiting Plate - PL	8	2.4316	636.40	6.35E+19	1.4465	156.73	3.888E-10
Limiting Circumferential Weld - CW	8	2.4321	636.31	6.32E+19	1.4457	156.64	6.622E-16
Limiting Forging - FO	n/a						
$TWCF_{95-TOTAL} = (\alpha_{AW}TWCF_{95-AW} + \alpha_{PL}TWCF_{95-PL} + \alpha_{CW}TWCF_{95-CW} + \alpha_{FO}TWCF_{95-FO})$ :							4.45E-08

(1) Material properties and fluence inputs are based on WCAP-18609-NP (Reference 9).

6. Duration of Proposed Alternative

This request is applicable to the St. Lucie Unit 1 inservice inspection program for the fifth and sixth 10-year inspection intervals.

7. Precedents

- “Surry Power Station Units 1 and 2 – Relief Implementing Extended Reactor Vessel Inspection Interval (TAC Nos. ME8573 and ME8574),” dated April 30, 2013, Agency wide Document Access and Management System (ADAMS) Accession Number ML13106A140.
- “Vogtle Electric Generating Plant, Units 1 and 2 – Request for Alternatives VEGP-ISI-ALT-05 and VEGP-ISI-ALT-06 (TAC Nos. MF2596 and MF2597),” dated March 20, 2014, ADAMS Accession Number ML14030A570.
- “Catawba Nuclear Station Units 1 and 2: Proposed Relief Request 13-CN-003, Request for Alternative to the Requirement of IWB-2500, Table IWB-2500-1, Category B-A and Category B-D for Reactor Pressure Vessel Welds (TAC Nos. MF1922 and MF1923),” dated March 26, 2014, ADAMS Accession Number ML14079A546.
- “Sequoyah Nuclear Plant, Units 1 and 2 – Requests for Alternatives 13-ISI-1 and 13-ISI-2 to Extend the Reactor Vessel Weld Inservice Inspection Interval (TAC Nos. MF2900 and MF2901),” dated August 1, 2014, ADAMS Accession Number ML14188B920.
- “Byron Station, Unit No. 1 – Relief from Requirements of the ASME Code to Extend the Reactor Vessel Inservice Inspection Interval (TAC No. MF3596),” dated December 10, 2014, ADAMS Accession Number ML14303A506.
- “Wolf Creek Generating Station – Request for Relief Nos. I3R-08 and I3R-09 for the Third 10-Year Inservice Inspection Program Interval (TAC Nos. MF3321 and MF3322),” dated December 10, 2014, ADAMS Accession Number ML14321A864.
- “Callaway Plant, Unit 1 – Request for Relief I3R-17, Alternative to ASME Code Requirements Which Extends the Reactor Vessel Inspection Interval from 10 to 20 Years (TAC No. MF3876),” dated February 10, 2015, ADAMS Accession Number ML15035A148.
- “Braidwood Station, Units 1 and 2 – Request for Relief from the Requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) (CAC Nos. MF8191 and MF8192),” dated March 15, 2017, ADAMS Accession Number ML17054C255.
- “South Texas Project, Units 1 and 2 – Relief from the Requirements of the ASME Code Regarding the Third 10-Year Inservice Inspection Program Interval (EPID L-2018-LLR-0010),” dated July 24, 2018, ADAMS Accession Number ML18177A425.
- “Donald C. Cook Nuclear Plant, Unit No. 1 – Approval of Alternative to the ASME Code Regarding Reactor Vessel Weld Examination – Relief Request ISIR-4-08 (EPID: L-2018-LLR-0106),” dated October 26, 2018, ADAMS Accession Number ML18284A310.

- R. E. Ginna Nuclear Power Plant – Issuance of Relief Request ISI-18 Regarding Fifth 10-year Inservice Inspection Program Interval (EPID L-2018-LLR-0104),” dated April 22, 2019, ADAMS Accession Number ML19100A004.
- “Point Beach Nuclear Plant, Units 1 and 2 – Approval of Relief Requests 1-RR-13 and 2-RR-13 Regarding Extension of Inspection Interval for Reactor Pressure Welds from 10 to 20 years (EPID L-2019-LLR-0060),” dated March 4, 2020, ADAMS Accession Number ML20036F261.
- “St. Lucie Plant, Unit 2 – Authorization of RR#15 Regarding Extension of ASME Requirements Related to Reactor Pressure Vessel Weld Examinations from 10 to 20 Years (EPID L-2020-LLR-0283),” dated September 30, 2021, ADAMS Accession Number ML21236A131.
- “Oconee Nuclear Station, Units 1, 2, and 3 – Authorization and Safety Evaluation for Alternative Reactor Pressure Vessel Inservice Inspection Intervals (EPID L-2021-LLR-0004),” dated November 19, 2021, ADAMS Accession Number ML21281A141.
- “Turkey Point Nuclear Generating Unit Nos. 3 and 4 – Authorization of Relief Request Nos. 8 and 9 Regarding Extension of Inspection Interval for Reactor Pressure Vessel Welds (EPID L-2021-LLR-0038),” dated May 10, 2022, ADAMS Accession Number ML22123A192.

## **8. References**

1. ASME Boiler and Pressure Vessel Code, Section XI, 2007 Edition through 2008 Addenda, American Society of Mechanical Engineers, New York.
2. PWROG Letter OG-10-238, “Revision to the Revised Plan for Plant Specific Implementation of Extended Inservice Inspection Interval per WCAP-16168-NP, Revision 1, “Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval.” PA-MS-0120,” July 12, 2010 (ADAMS Accession Number ML11153A033).
3. NRC Regulatory Guide 1.174, Revision 1, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” U.S. Nuclear Regulatory Commission, November 2002, (ADAMS Accession Number ML023240437).
4. Westinghouse Report, WCAP-16168-NP-A, Revision 3, “Risk-Informed Extension of the Reactor Vessel In-service Inspection Interval,” October 2011 (ADAMS Accession Number ML11306A084).
5. NUREG-1874, “Recommended Screening Limits for Pressurized Thermal Shock (PTS),” U.S. Nuclear Regulatory Commission, March 2010, (ADAMS Accession Number ML15222A848).
6. NRC Letter Report, “Generalization of Plant-Specific Pressurized Thermal Shock (PTS) Risk Results to Additional Plants,” U.S. Nuclear Regulatory Commission, December 14, 2004 (ADAMS Accession Number ML042880482).
7. Code of Federal Regulations, 10 CFR Part 50.61a, “Alternate Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events,” U.S. Nuclear Regulatory Commission, Washington D. C., Federal Register, Volume 75, No. 1, dated January 4, 2010 and No. 22 with corrections to part (g) dated February 3, 2010, March 8, 2010, and November 26, 2010.

8. NRC Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," U.S. Nuclear Regulatory Commission, May 1988, (ADAMS Accession Number ML003740284).
9. Westinghouse Report, WCAP-18609-NP, Revision 2, "St. Lucie Units 1 & 2 Subsequent License Renewal: Time-Limited Aging Analyses on Reactor Vessel Integrity," July 2021.