



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE N.E., SUITE 1200
ATLANTA, GEORGIA 30303-1200

April 27, 2022

Mr. Bob Coffey
Executive Vice President, Nuclear
and Chief Nuclear Officer
Florida Power and Light Company
700 Universe Blvd.
Mail Stop: EX/JB
Juno Beach, FL 33408

SUBJECT: ST. LUCIE PLANT UNITS 1 AND 2 – DESIGN BASIS ASSURANCE
INSPECTION (PROGRAMS) INSPECTION REPORT 05000335/2022010 AND
05000389/2022010

Dear Mr. Coffey:

On March 18, 2022, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at St. Lucie Plant Units 1 and 2. On April 1, 2022, the NRC inspectors discussed the results of this inspection with Mr. Dan DeBoer, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

One finding of very low safety significance (Green) is documented in this report. This finding involved a violation of NRC requirements. We are treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violation or the significance or severity of the violation documented in this inspection report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement; and the NRC Resident Inspector at St. Lucie Plant Units 1 and 2.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

A handwritten signature in black ink, appearing to be 'JB' with a horizontal line extending to the right.

Signed by Baptist, James
on 04/27/22

James B. Baptist, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 05000335 and 05000389
License Nos. DPR-67 and NPF-16

Enclosure:
As stated

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SUBJECT: ST. LUCIE PLANT UNITS 1 AND 2 – DESIGN BASIS ASSURANCE
INSPECTION (PROGRAMS) INSPECTION REPORT 05000335/2022010 AND
05000389/2022010 DATED APRIL 27, 2022

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* = concurred by email

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OFFICE	NRR	RII/DRS	NSIR/DRP	RII/DRS	RII/DRS
NAME	M. Yeminy*	K. Kirchbaum*	B. Smith*	G. Ottenberg*	J. Baptist
DATE	04/15/2022	04/18/2022	04/25/2022	04/25/2022	04/27/2022

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Numbers: 05000335 and 05000389

License Numbers: DPR-67 and NPF-16

Report Numbers: 05000335/2022010 and 05000389/2022010

Enterprise Identifier: I-2022-010-0022

Licensee: Florida Power and Light Company

Facility: St. Lucie Plant Units 1 and 2

Location: Jensen Beach, FL

Inspection Dates: February 28–March 18, 2022

Inspectors: G. Ottenberg, Senior Reactor Inspector
K. Kirchbaum, Operations Engineer
B. Smith, Nuclear Systems Engineer
M. Yeminy, Contractor

Approved By: James B. Baptist, Chief
Engineering Branch 1
Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a design basis assurance inspection (programs) inspection at St. Lucie Plant Units 1 and 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

List of Findings and Violations

Failure to Consider Maximum Transmitted Torque in Motor Operated Valve Structural Evaluation			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000335,05000389/2022010-01 Open/Closed	None (NPP)	71111.21N.02
The inspectors identified a Green finding and associated non-cited violation (NCV) of Title 10 of the Code of Federal Regulations (10 CFR) Part 50, subsection 55a(b)(3)(ii), when the licensee did not establish a motor operated valve (MOV) program that ensured the butterfly valves within the program continued to be capable of performing their function. Specifically, the licensee did not appropriately include and consider the Electric Power Research Institute (EPRI) Performance Prediction Methodology (PPM) calculated maximum transmitted torque in their MOV program instructions for evaluating the acceptability of the structural limitations of the butterfly valve weak link and the actuator ratings.			

Additional Tracking Items

None.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection, unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met, consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.21N.02 - Design-Basis Capability of Power-Operated Valves Under 10 CFR 50.55a Requirements

POV Review (IP Section 03) (8 Samples)

The inspectors:

- a. Evaluated whether the sampled POVs are being tested and maintained in accordance with NRC regulations along with the licensee's commitments and/or licensing bases. Specific Guidance
- b. Evaluated whether the sampled POVs are capable of performing their design-basis functions.
- c. Evaluated whether testing of the sampled POVs is adequate to demonstrate the capability of the POVs to perform their safety functions under design-basis conditions.
- d. Evaluated maintenance activities, including a walkdown of the sampled POVs (if accessible).

- (1) 2-MV-07-2A, Safety Injection Pump Containment Sump Suction Valve
- (2) 1-HCV-3625, 1A1 Low Pressure Safety Injection Cold Leg Injection Isolation Valve
- (3) 2-MV-08-19B, Main Steamline Atmospheric Dump Valve
- (4) 1-2515, Primary Isolation Valve (Penetration P-26) for Reactor Coolant Loop 1B1 Letdown
- (5) 2-MV-08-12, Auxiliary Feedwater Pump Turbine Steam Supply Valve
- (6) 2-MV-09-12, 2C Auxiliary Feedwater Flow Control Valve
- (7) 1-HCV-08-1A, 1A Main Steam Isolation Valve
- (8) 2-HCV-09-2A, Main Feedwater Isolation Valve B Train at Penetration P-4

INSPECTION RESULTS

Failure to Consider Maximum Transmitted Torque in Motor Operated Valve Structural Evaluation			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000335,05000389/2022010-01 Open/Closed	None (NPP)	71111.21N.02
<p>The inspectors identified a Green finding and associated non-cited violation (NCV) of Title 10 of the Code of Federal Regulations (10 CFR) Part 50, subsection 55a(b)(3)(ii), when the licensee did not establish a motor operated valve (MOV) program that ensured the butterfly valves within the program continued to be capable of performing their function. Specifically, the licensee did not appropriately include and consider the Electric Power Research Institute (EPRI) Performance Prediction Methodology (PPM) calculated maximum transmitted torque in their MOV program instructions for evaluating the acceptability of the structural limitations of the butterfly valve weak link and the actuator ratings.</p>			
<p><u>Description:</u> The inspectors reviewed the safety injection pump containment sump suction valve, 2-MV-07-2A, to evaluate its ability to open and close according to its design requirements. The valve has safety functions to open to allow flow from the containment sump to the suction of the safety injection and containment spray pumps, and to close to isolate a limited leakage passive failure that is postulated to occur downstream of the valve. To determine the torque required to open and close the valve, the licensee utilized the EPRI PPM which involves the use of computer software to perform the calculation. The EPRI PPM software also calculates the “maximum transmitted torque,” which is the maximum valve stem torque predicted by the model, and its magnitude is equal to the larger of the required actuation torque and the peak hydrodynamic torque. This torque is used to determine if the torque rating of the actuator will be exceeded and to evaluate the structural adequacy of the valve stem and its connections to the actuator and to the disk. The program described in TR-103237, EPRI MOV Performance Prediction Program, details that the maximum transmitted torque is the “additional torque calculated by the model for use in structural evaluation of MOV components.”</p>			
<p>The inspectors identified that the valve structural limits for the 2-MV-07-2A valve were determined in evaluations, 1331762-DD-1, Weaklink Analysis for 24”- Model NMKII Butterfly Valve with Limitorque H3BC / SMB-00-10 Operator Tag #: Unit 1- MV-07-2A & MV-07-2B, and in DD-99, Engineering Analysis of Torque Requirements for Nuclear Butterfly Valves-FPL P.O. #C9293491253, and that the Limitorque actuator ratings were contained in Limitorque sizing and selection documents (SELs). The inspectors determined the licensee had not compared the valve structural limits determined in 1331762-DD-1 and DD-99 and the actuator structural limits in the SELs to the maximum transmitted torque value calculated by the EPRI PPM and instead inappropriately only compared the structural limits to the less limiting calculated value of required torque. Further, the inspectors determined that the maximum transmitted torque value calculated by the EPRI PPM when evaluating the close stroke direction exceeded the calculated valve weak link torque values and the published actuator rated torque values.</p>			
<p>Upon review of the licensee’s failure to compare the maximum transmitted torque to the valve weak link and the actuator ratings, the inspectors determined that STD-M-003, Engineering Guidelines for Sizing and Evaluation of Limitorque Motor Operators, did not provide guidance</p>			

describing the need to compare the valve structural limitations and actuator ratings to the maximum transmitted torque, and only provided guidance to compare the valve structural limits and actuator ratings to the calculated required torque. Once it was discovered the comparison of the structural limits to the maximum transmitted torque was never completed, the licensee entered the issue into their corrective action program for evaluation.

Corrective Actions: Florida Power and Light personnel entered the issue into their corrective action program for further evaluation. During the week of March 21, 2022, the licensee re-evaluated the valve closure scenario and determined the original calculation contained system parameters (differential pressure and flow) that were overly conservative and not required by the valve's design basis. The licensee reduced the assumption for expected flow in the system and re-ran the PPM software and obtained results that supported that the valve and actuator structural components would not be over-stressed. The licensee plans to complete calculations that are more reflective of the actual valve requirements and incorporate more specific instructions into their MOV program guidance to address the maximum transmitted torque for quarter turn valves.

Corrective Action References: AR 2422566

Performance Assessment:

Performance Deficiency: The licensee failed to appropriately include and consider the EPRI PPM calculated maximum transmitted torque in their MOV program instructions for evaluating the acceptability of the structural limitations of the butterfly valve weak link and the actuator ratings. The licensee should have been aware that this potentially more limiting torque value had the potential to overload valve and actuator components through their use of the EPRI PPM.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the licensee failed to verify the capability of the valve and actuator sub-components to withstand the applied forces that would be present during and following design basis events.

Significance: The inspectors assessed the significance of the finding using Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." The finding screened as of very low safety significance (Green) because it was a deficiency affecting the design or qualification of a mitigating SSC, and the SSC maintained its operability or PRA functionality.

Cross-Cutting Aspect: Not Present Performance. No cross-cutting aspect was assigned to this finding because the inspectors determined the finding did not reflect present licensee performance.

Enforcement:

Violation: 10 CFR 50.55a(b)(3)(ii) required, in part, "OM condition: Motor-Operated Valve (MOV) testing. Licensees must comply with the provisions for testing MOVs in ASME OM Code, ... and must establish a program to ensure that MOVs continue to be capable of performing their design basis safety functions." Contrary to the above, the licensee did not establish a program that ensured the butterfly valves within the program continued to be capable of performing their function. Specifically, butterfly valves may experience applied

torques higher than those calculated for the required torque for the valve, and the associated higher stress applied to the valve and actuator sub-components was not required to be evaluated by the MOV program instructions.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On March 18, 2022, the inspectors presented the onsite inspection results to Mr. Carlos Santos and other members of the licensee staff.
- On April 1, 2022, the inspectors presented the design basis assurance inspection (programs) inspection results to Mr. Dan DeBoer, Site Vice President, and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71111.21N.02	Calculations	DC-025	Required Thrust and Weak Link Calculations- required thrust and maximum thrust calculations	0
		DD-99	Engineering Analysis of Torque Requirements for Nuclear Butterfly Valves- FPL P.O. #C9293491253	01/07/1993
		JPN-PSL-SEMP-93-036	Pressure Locking and Thermal Binding of Motor Operated Gate Valves	0
		L-MECH-CALC-017	Evaluation of the Calculations Made by Florida Power and Light for the Minimum and Maximum Torque Requirements of the Butterfly Motor Operated Valves in the Generic Letter 89-10 Program at St. Lucie Unit 2	7 & 17
		MA-23698	Actuator Calculation Criteria and Capability Margins	E
		PSL-1-FJE-90-002	GL 89-10 MOV Cable Voltage Drop, St. Lucie Unit 1	12
		PSL-1FJM-91-011	NRC Generic Letter 89-10 MOV Design Basis Differential Pressure Determination	15
		PSL-1FJM-91-017	NRC Generic Letter 89-10 Gate/Globe Valve Motor-Operator Evaluations	25
		PSL-2-J-E-90-003	GL 89-10 MOV Cable Voltage Drop, St. Lucie Unit 2	10
		PSL-2FJE-94-003	GL 89-10 125 VDC Motor Operated Valve Cable Voltage Drop, St. Lucie Unit 2	4
		PSL-2FJM-91-046	St. Lucie Unit 2 Generic Letter 89-10 Design Basis Differential Pressures for Motor Operated Valves	14
		PSL-2FJM-91-048	St. Lucie Unit 2 Generic Letter 89-10 Gate and Globe Valve Required Stem Thrust and Actuator Torque Switch Setting Evaluation	30
		PSL-2FJM-93-002	GL 89-10 Differential Pressure Calculation for St. Lucie Unit 2 HPSI and AFW Motor Operated Valves	4 & 6
	Corrective Action Documents	ARs 02268907, 02298807, 02150607, 02396453, 02006410		

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Corrective Action Documents Resulting from Inspection	AR 2420540	2022 POV Insp- NOP Guidance for MOV Jogging Inadequate	03/04/2022
		AR 2421591	2022 POV Insp- MV-07-2A Motor Insulation Documentation Documentation Only Issue with EQ Doc Pac 2998-A-451-3.1	03/15/2022
		AR 2421767	NRC ISFSI MOV Inspection - MOV T-Drain Painted Over	03/17/2022
		AR 2421778	U1 ECCS FATHOM Hydraulic Model Error, HCV-3625 K-Factor	03/17/2022
		AR 2421835	Calculation PSL-1FJM-91-01 Valve Thrust Discrepancy	03/17/2022
		AR 2421869	2022 POV Insp- Eval Effects of MOV Jogging / Throttling	03/18/2022
		AR 2421874	2022 POV Insp- Use of PPM When Classifying MOVs	03/18/2022
		AR 2422240	2-MV-07-2A MTR Torque Derate Not Evaluated, Limitorque 93-03	03/22/2022
		AR 2422566	2-MV-07-2A MOV PPM Calc Max Torque Exceeds Weak Link Torque	03/24/2022
	Drawings	2998-1871	600# MO Valves Tag # I-MV-09-11&12	8
		2998-19252	4"-600 Weld Ends Carbon Steel Double Disk Gate Valve for SMP-00-10 (D.C.) Limitorque Actuator	1
		2998-19745	4"-600 Weld Ends Carbon Steel Model 70-28-2 Globe Control Valve W/SMP-000-5 Limitorque Actuator	4
		2998-2236	24in M/O BFLY VL No. 1- 2-MV-07-2A & 2B 8770-3820	3
		2998-2237	Cross Section Dwg for I-MV-07-1A, 1B, 2A	1
		2998-3847	Mot. Op. for Valve I-MV-07-2A & 2B	1
		2998-9695	Schematic for Anchor Darling Self Contained Hydraulic Actuator Non-Redundant	13
		2998-B-327 Sheet 299	Control Wiring Diagram Reactor Sump Valve MV-07-2A	9
		2998-B-327 Sheet 32	Control Wiring Diagram General Notes	5
		2998-G-078 Sheet 130B	Flow Diagram Safety Injection System	39
		2998-G-088 Sheet 2	Flow Diagram Containment Spray and Refueling Water Systems	50

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		2998-G-125 Sheet SI-N-I	Large Bore Piping Isometric Safety Injection	27
		8770-1375	SI Motor Valve HCV-3615, 3625, 3635, 3645	6
		8770-1574	Limiterque Valve Control	5
		8770-B-327 Sheet 260	Low Press Safety Inject Flow Cont Valve HCV-3625	13
		8770-G-078 Sheet 130A	Flow Diagram Safety Injection System	30
		8770-G-078 Sheet 130B	Flow Diagram Safety Injection System	40
		8770-G-078 Sheet 131B	Flow Diagram Safety Injection System	20
		8770-G-078, Sheet 131A	Flow Diagram Safety Injection System	31
	Engineering Changes	EC 209138	Replaced Motor on Limitorque Actuator on MV-07-2A with Equivalent Motor Per IEE 76263.	10/30/2006
		PCM 200-283-16	Main Feedwater Isolation Valves Relief Orifice Modification	0
	Engineering Evaluations	1331762-00-1	WEAKLINK ANALYSIS for 24"- Model NMKII Butterfly Valve With Limitorque H3BC / SMB-00-10 Operator Tag #: Unit 1- MV-07-2A & MV-07-2B	1
		Document No. 2576C	St. Lucie MOV Periodic Verification Classification	0
		JPN-PSL-SEMP-93-031	Substantial Safety Hazard Evaluation of Limitorque Valve Actuators with AC Motors	2
		JPN-PSL-SEMS-96-070	Evaluation of EPRI MOV Performance Prediction Program Results- MPR Report 1759	4
		MPR Report 1759, Part 16	Evaluation of Stem Thrust Requirements for MV-07-2A and MV-07-2B Using the EPRI MOV Globe Valve Performance Prediction Methodology	06/17/1996
		PSL-ENG-SEMS-19-002	Evaluation of Conditions/Limitations in the NRC Safety Evaluation Report on the EPRI MOV PPM	0
		PSL-ENG-SEMS-97-062	GL 89-10 MOV Program Load Sensitive Behavior Engineering Evaluation	0

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Miscellaneous	01855973	Root Cause Evaluation for Unit 1 Automatic Reactor Trip due to Failure of 1B Main Steam Isolation Valve	04/23/2013
		2998-4508	Henry Pratt Butterfly Valves	27
		3332C	Kalsi Report for St. Lucie Unit 1 MSIV Redesign for EPU Conditions Post March 2013 Event	0
		8770-6271	VELAN VALVES AND MAINTENANCE INSTRUCTIONS (PI-1184-N)	30
		CN-SEE-II-09-4	St. Lucie Unit 1 Emergency Core Cooling System (ECCS) Delivery and Surveillance Test Requirements	2
		DBD-CS-2	Containment Spray System	6
		DBD-SDC-1	Low Pressure Safety Injection and Shutdown Cooling System	11
		EQUIPMENT QUALIFICATION DOCUMENTATION PACKAGE 2998-A-451-3.1	Limatorque Corporation Motor Operators	17
		ER-AA-113	Inservice Testing (IST) Program	3
		ER-AA-116	Motor Operated Valve Program	8
		SPEC-M-188	Specification for Main Steam Isolation Valve Replacement Actuator	2
		STD-M-003	Engineering Guidelines for Sizing and Evaluation of Limatorque Motor Operators	6
	Procedures	2-OSP-09.01C	2C Auxiliary Feedwater Pump Code Run	27
		ADM-03.04	Motor Operated Valve Trending and Monitoring	13
		ADM-29.01A	Inservice Testing (IST) Program for Pumps and Valves	32
		ER-AA-113-1000	Inservice Testing Procedure	8
		ER-AA-113-1007-10000	Preconditioning of Structures, Systems and Components	0
		ER-AA-116	Motor Operated Valve Program	8
		MA-AA-100-1014	Limatorque Motor Operated Valve Testing and Actuator Inspections	10
		MA-AA-100-1020	Limatorque Motor Operated Valve Stem Lube and Full Actuator Inspection	3

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Work Orders	WO 40696460-01, 40765714-01, 37013972-01, 40568241-01, 40554564-01, 40717669-01, 40774350-01, 40641408-01, 40641408-07, 40605121-01, 40758776-01, 40773331-01, 40696151-01, 40718324-04		