



Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

February 2, 2004

L-2004-017
10 CFR § 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 2003-005-00
Date of Event: December 3, 2003
Condition Prohibited by Tech Specs Due
to Failed Containment Vacuum Breakers

The attached Licensee Event Report 2003-005 is being submitted pursuant to the requirements of 10 CFR § 50.73 to provide notification of the subject event.

Very truly yours,

A large, stylized handwritten signature in black ink, appearing to read 'WJ', is written over the typed name and title.

William Jefferson, Jr.
Vice President
St. Lucie Nuclear Plant

WJ/KWF
Attachment

IE22

NRC FORM 366 (7-2001)		U.S. NUCLEAR REGULATORY COM			APPROVED BY OMB NO. 3150-0104			EXPIRES 7-31-2004			
LICENSEE EVENT REPORT (LER)					Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.						
FACILITY NAME (1) <p style="text-align: center;">St. Lucie Unit 1</p>					DOCKET NUMBER (2) <p style="text-align: center;">05000335</p>			PAGE (3) <p style="text-align: center;">Page 1 of 4</p>			
TITLE (4) <p style="text-align: center;">Condition Prohibited by Tech Specs Due to Failed Containment Vacuum Breakers</p>											
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
12	03	2003	2003	- 005	- 00	02	02	2004	FACILITY NAME	DOCKET NUMBER	
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
1		20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)	
POWER LEVEL (10)		20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)		50.73(a)(2)(x)	
100		20.2203(a)(1)			50.36(c)(1)(i)(A)			50.73(a)(2)(iv)(A)		73.71(a)(4)	
		20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)		73.71(a)(5)	
		20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)		OTHER	
		20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)		Specify in Abstract below or in NRC Form 366A	
		20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)			
		20.2203(a)(2)(v)			X 50.73(a)(2)(i)(B)			50.73(a)(2)(vii)			
		20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)			
		20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(viii)(B)			
LICENSEE CONTACT FOR THIS LER (12)											
NAME <p style="text-align: center;">Kenneth W. Frehafer, Licensing Engineer</p>						TELEPHONE NUMBER (Include Area Code) <p style="text-align: center;">(772) 467 - 7748</p>					
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		
X	BF	V	P070	YES	-	-	-	-	-		
SUPPLEMENTAL REPORT EXPECTED (14)						EXPECTED SUBMISSION DATE (15)			MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).				X	NO						
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)											
<p>On December 3, 2003, St. Lucie Unit 1 was in Mode 1 at 100 percent reactor power. During repair activities associated with containment vacuum relief valve FCV-25-8, FPL determined that a common cause failure mechanism affected the past operability of both of the containment vacuum relief valves' actuator quick exhaust valves.</p> <p>The cause of the failures was degradation of the quick exhaust valves' urethane diaphragm that allowed air to bypass the actuator as air exhausted through the quick discharge port. This caused the containment vacuum relief valves to fail to open on demand.</p> <p>Both containment vacuum relief valve quick exhaust valves for FCV-25-7 and -8 were replaced and tested satisfactorily. A preventive maintenance change was also processed to perform a quick exhaust valve overhaul every 36 months.</p> <p>The containment vacuum relief function is provided to protect the containment structure from a vacuum condition caused by an inadvertent cooldown from full containment spray and fan cooler actuation. The vacuum relief function is not a design bases accident mitigation function. Therefore, this event had no adverse impact on the health and safety of the public.</p>											

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Description of the Event

On December 3, 2003, St. Lucie Unit 1 was in Mode 1 at 100 percent reactor power. During performance of the containment fan cooler monthly surveillance (procedure 1-OSP-25.02), the containment vacuum relief valve [EIIS:BF:FCV] FCV-25-8 failed to stroke full open on demand. When pressure returned to the reset point, the valve closed. Operations entered Technical Specification (TS) Action Statement (AS) 3.6.5.1. that requires with one vacuum relief line inoperable, the vacuum relief line be restored to operable status within 72 hours or the unit must be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

During the repair activities the valve actuator quick exhaust valve [EIIS:BF:V] (QEV) was found to be defective and replaced. Subsequent valve strokes went full open and the valve post maintenance stroke time test was satisfactorily completed.

The opposite train valve, FCV-25-7, had failed inservice testing (IST) stroke time testing two days earlier and was repaired on December 2, 2003. The earlier failure was also due to a defective QEV, which was replaced. When both of the QEVs were later disassembled, the internal urethane diaphragms were found to be failed.

Protection of the containment vessel against excessive external pressure is provided by two independent vacuum relief lines each sized to prevent the differential pressure between the containment and the shield building atmosphere from exceeding the design value of 0.70 psig. Each vacuum relief assembly consists of a check valve inside and an automatic air-operated butterfly valve outside the containment vessel. Actuation of the butterfly valve is controlled by differential pressure between the shield building annulus and the containment vessel. Redundant transmitters sense the differential pressure and provide a signal to the pilot solenoid on the air-operated butterfly valve to open.

The vacuum breaker check valve is required to open at 1.1" wg differential pressure and the butterfly valve is set to open at a differential pressure of 2.25" wg.

Since the vacuum relief valves also perform a containment isolation function in case of a LOCA, the automatic butterfly valves are designed to fail closed. The electrical supply for the controls of each of the redundant automatic valves is from a separate emergency 125 V dc bus. The design is such that no active single failure can prevent operation of both redundant vacuum relief assemblies.

Cause of the Event

The cause of the QEV failure is the time-dependent degradation of its urethane diaphragm. During the maintenance troubleshooting for both valves, FPL determined that each QEV diaphragm had failed, allowing air to bypass the actuator as air exhausted through the QEV quick discharge port. For FCV-25-8, this resulted in failing to provide enough air to the valve operator to completely open the valve. For FCV-25-7, this resulted in failing the valve closed.

Maintenance history indicates that the QEVs had been replaced in October 1999 for FCV-25-7 and -8. The QEV diaphragms failed due to the same cause within two days of each other. A review of the preventive maintenance (PM) database showed that the actuators of both valves had been overhauled in 1999 using the Bettis actuator overhaul procedure. While the procedure did not specifically mention the replacement of the QEVs the "materials used" section of the work orders showed that the QEVs were replaced. There was no material change from that of the QEV diaphragms replaced in 1999. Industry operating experience was searched and the diaphragm material is

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suiting for the application. However, based on the QEV diaphragm age-related degradation, a preventive maintenance (PM) change was processed to initiate a QEV overhaul with a 36-month frequency. Generically, St. Lucie will assess the current site-wide PM process as part of an upcoming PM optimization program.

Analysis of the Event

Based on the observed test failures and the common cause age-related failure mechanism of the QEV diaphragms, a failure to open on demand would have been highly likely during a containment vacuum relief event. The time related common cause failure mechanism is indicative of a condition where both trains of containment vacuum breakers were unable to perform their specified function in excess of the allowed Technical Specification outage time. Therefore, this condition is reportable under 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications.

Although this condition resulted in a loss of the containment vacuum function (an analyzed transient), this did not result in the loss of a safety function required to shutdown the reactor, remove decay heat, control releases, or mitigate the consequences of an accident. Therefore, 10 CFR 50.73(a)(2)(v) reporting criteria are not applicable.

Analysis of Safety Significance

The containment vacuum breakers have a safety-related containment integrity function. The failed QEV diaphragms had no impact on the containment vacuum breakers ability to remain closed and provide a passive containment pressure integrity function. The vacuum relief function is provided as a protective feature for the containment liner. Protection of a fission product barrier against transients warrants that the vacuum relief function be governed by a Technical Specification.

The St. Lucie Unit 1 Updated Final Safety Analysis Report (UFSAR) analysis for vacuum relief assumes the operation of one vacuum relief line fully open, while the redundant line is assumed to be inoperable. The transient includes activation of all containment fan coolers concurrent with operation of both trains of the containment spray system. The vacuum relief line fully opens within a few seconds to prevent the differential pressure between the containment and the shield building atmosphere from exceeding the design basis limit of 0.70 psig. The maximum differential pressure from the analysis is 0.66 psig. Failure of the vacuum relief function could challenge the containment liner; however, the inadvertent containment-cooling transient is not a core damage or fission product release design basis accident. Likewise, during design bases accidents that require containment integrity to contain fission products, the containment structure is not subjected to vacuum conditions. Therefore, this condition had no adverse effect on the health and safety of the public.

This condition is not applicable to St. Lucie Unit 2 as the containment vacuum relief line valve actuators do not use the St. Lucie Unit 1 QEV design. These QEVs are not used in any other applications for St. Lucie Units 1 and 2.

Corrective Actions

1. The actuators for FCV-25-7 and -8 were repaired and returned to service.
2. A preventive maintenance change request was submitted to overhaul the actuator QEVs for FCV 25-7 and -8 on a 36-month basis.

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Additional Information

Failed Components Identified

Component Tag: FCV-25-7 and -8 Actuator Quick Exhaust Valve
Manufacturer: Parker
Model Number: OR75B

Similar Events

None