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May 4, 2006  
JAFP-06-0071

Pete Dietrich  
Site Vice President - JAF

United States Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Subject: **Docket No. 50-333**  
**LICENSEE EVENT REPORT: LER-06-001 (CR-JAF-2006-00979)**

**Inoperable Reactor Building-To-Suppression Chamber Vacuum Breaker In  
Excess of Technical Specifications Allowed Out Of Service Time**

Dear Sir:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the plant's Technical Specifications."

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Jim Costedio at (315) 349-6358.

Very truly yours,

A large, stylized handwritten signature in black ink, appearing to read "P. Dietrich".

Pete Dietrich

PD:DD:dd  
Enclosure

cc: USNRC, Region 1  
USNRC, Project Directorate  
USNRC Resident Inspector  
INPO Records Center

JL22

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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.

**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

<b>1. FACILITY NAME</b> James A. FitzPatrick Nuclear Power Plant	<b>2. DOCKET NUMBER</b> 05000333	<b>3. PAGE</b> 1 OF 6
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**4. TITLE** Inoperable Reactor Building-To-Suppression Chamber Vacuum Breaker In Excess of Technical Specifications Allowed Out Of Service Time

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	06	06	06	001	00	05	04	06	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000

<b>9. OPERATING MODE</b>	1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>									
<b>10. POWER LEVEL</b>	100	20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)			
		20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)			
		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 Specify in Abstract below or in NRC Form 366A			
		20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)					
		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)					

**12. LICENSEE CONTACT FOR THIS LER**

NAME Mr. Darren Deretz, Sr. Regulatory Compliance Specialist	TELEPHONE NUMBER (Include Area Code) (315) 349-6851
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	BF	VACB	F130	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE) X NO				

**16. ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On March 6, 2006, with the plant operating at 100 percent power, it was determined that the reactor building-to-suppression chamber vacuum breaker isolation valve (27AOV-101A) was not fully closed although remote position indication showed the valve was in the closed position. This condition was discovered during troubleshooting activities to determine the cause of rising oxygen concentration levels in the suppression chamber.

The failure of 27AOV-101A to be fully closed resulted in not meeting LCO 3.6.1.6 for approximately 11 days and 20 hours. This period exceeded Technical Specifications (TS) 3.6.1.6 Required Action and associated Completion Time requirements of 72 hours and is therefore a condition prohibited by the plant's TS. There were no nuclear, radiological or safety consequences associated with this event.

The failure of the valve to fully close was a result of mechanical binding between the valve shaft and the valve's manual actuator coupling block due to galling of the stainless steel material.

Immediate short term actions included removal of the valve's manual actuator coupling block and returning the valve to an operable condition. Additional actions of performing Preventive Maintenance (lubrication) and installing new bronze bushings on valves with similar manual actuator couplings are planned and scheduled.

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

EIIS Codes in [ ]

**BACKGROUND**

The function of the reactor building-to-suppression chamber vacuum breaker assemblies [BF] is to relieve vacuum when the suppression chamber [NH] depressurizes below reactor building [NG] pressure. If the suppression chamber depressurizes below reactor building pressure, the negative differential pressure is mitigated by flow through the reactor building-to-suppression chamber vacuum breaker assemblies. The design of the reactor building-to-suppression chamber vacuum relief system [BF] consists of two 100% capacity vacuum breaker assemblies each consisting of a (check valve type) vacuum breaker (VB) and an air operated (AOV) butterfly valve, located in series in each of two branch lines from a single penetration through the reactor building to a common line that penetrates the suppression chamber airspace. The vacuum breaker is self actuating. The butterfly valve is actuated by pressure differential or can be remotely operated by a control switch in the control room. Both the butterfly valve and the vacuum breaker valve must be closed (except during testing) to maintain a leak tight primary containment [NH] boundary. The safety analyses assume the vacuum breaker assembly valves are closed initially and start to open at less than or equal to 0.5 pounds per square inch differential (psid). Additionally, of the two vacuum breaker assembly valves, one is assumed to fail in a closed position.

The reactor building-to-suppression chamber vacuum breaker isolation valve (27AOV-101A) is a twenty (20) inch air operated Fisher series 9200 butterfly valve with a Bettis air actuator located on one end of the valve shaft and a manual operator located at the opposite end of the valve shaft. The air and manual valve actuators are coupled to the valve shaft, at opposite ends, by means of manual external keys and keyways. When the valve is in automatic operation, the air actuator is coupled to the valve shaft and rotates the shaft. The manual side coupler is uncoupled and stationary while the valve shaft rotates approximately eighty (80) degrees back and forth as the valve is cycled. With proper alignment between the manual output shaft and valve shaft, there is no load bearing contact between the shaft and manual side coupling block when disengaged.

**EVENT DESCRIPTION**

On March 6, 2006, at approximately 2100 hours, with the plant operating at 100 percent power, it was determined that the reactor building-to-suppression chamber vacuum breaker isolation valve (27AOV-101A) was not fully closed (seated) although remote position indication showed the valve was in the closed position. This condition was discovered during troubleshooting activities to determine the cause of rising oxygen concentration levels in the suppression chamber. Over approximately an eleven (11) day period prior to this discovery, oxygen concentration levels in the suppression chamber had increased from approximately two (2) percent volume to three (3) percent volume, well within the Technical Specifications (TS) limit of four (4) percent.

The suppression chamber oxygen concentration increased following the performance of Instrument Surveillance Procedure (ISP) -89, Suppression Chamber/Reactor Building Vacuum Breaker Quarterly Functional Calibration. The oxygen increase is typical following this ISP because the vacuum breaker isolation valve is cycled allowing reactor building air, containing oxygen, to flow into the suppression chamber. After a period of time, the oxygen level typically decreases. However, the oxygen level continued to trend upward prompting troubleshooting activities.

As part of the troubleshooting activities, plant operators checked 27AOV-101A to confirm the valve was fully closed. During this check, plant operators noted slight movement of the valve shaft while trying to manually move the valve to the closed direction, providing evidence that the valve disc was slightly disengaged from its seat.

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**EVENT DESCRIPTION (continued)**

Operations concluded that 27AOV-101A had remained in the not fully closed position since the valve was last stroked during performance of ISP-89. This functional calibration started at approximately 0800 hours on February 23, 2006. Following this functional calibration, the remote position indication of the valve indicated the valve was closed giving no indication to plant operators that the valve disc was slightly disengaged from its seat.

27AOV-101A is equipped with position indication that remotely indicates, in the Relay Room, whether the valve is in the closed, open or intermediate position. In this case, the valve shaft rotated beyond the associated limit switch setpoint thereby actuating the limit switch and indicating remotely that the valve was in the closed position. The limit switch operated as expected and designed. The associated limit switch can not change state at the fully seated point as the limit switch requires valve shaft rotation to physically actuate the limit switch. When the valve is fully seated, the valve shaft rotation stops and therefore no motion is available to actuate the limit switch. Consequently, the limit switch is calibrated to actuate just prior to full seat contact which is consistent with industry standard practice.

As a result of 27AOV-101A being not fully seated, a small flow path across the valve seat was created. Due to containment pressure being less than reactor building pressure, a differential pressure existed across the associated vacuum breaker valve (check valve) VB-6 forcing VB-6 to open slightly, thereby allowing reactor building air to flow into the suppression chamber. This flow path caused the oxygen level in the suppression chamber to increase slightly over time, prompting the troubleshooting previously discussed. The oxygen level remained well within the TS limit of four (4) percent volume.

Inspection of 27AOV-101A showed that there was mechanical binding between the valve shaft and the manual actuator coupling block. The manual actuator coupling block was removed to preclude further mechanical binding (see cause section below) and the valve disc was confirmed to be fully seated. The valve was determined to be operable at approximately 0400 on March 7, 2006. The suppression chamber oxygen level subsequently returned to normal.

The plant's TS Limiting Conditions for Operation (LCO) 3.6.1.6, "Reactor Building-to-Suppression Chamber Vacuum Breakers", requires that each reactor building-to-suppression chamber vacuum breaker be operable in Modes 1, 2 and 3. TS 3.6.1.6 also requires that a vacuum breaker that is not closed (Condition A) be closed within 72 hours and an inoperable vacuum breaker (Condition C) be restored within 72 hours. If these Required Actions and associated Completion Times are not met, then the plant must be placed in Mode 3 in 12 hours and Mode 4 in 36 hours. As vacuum breaker 27AOV-101A was not fully closed and was inoperable for a duration of approximately 11 days and 20 hours, which is in excess of the TS allowed out of service time (AOT), this report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the plant's Technical Specifications."

There were no nuclear, radiological, or safety consequences associated with this event.

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**CAUSE OF EVENT**

The failure of 27AOV-101A to fully close was a result of mechanical binding due to dynamic adhesive wear (galling) between the valve shaft and manual actuator coupling block. Both the valve shaft and the manual actuator coupling block are constructed of type 410 stainless steel, which has poor dynamic adhesive wear properties, commonly identified as tendency to gall. Repetitive valve cycling combined with misalignment lead to eventual dynamic adhesive wear between the metal surfaces. The mechanism of adhesive wear involves the micro-welding of very small raised areas in the two surfaces that rapidly escalates to large wear scars and displacement of metal. This displaced metal fills the narrow space between the two subcomponents and leads to binding or seizing of the moving surface. [Cause Code B]

**EVENT ANALYSIS**

There were no nuclear, radiological or safety consequences associated with this event.

During the time period that 27AOV-101A was inoperable, the redundant alternate side vacuum breaker assembly was operable and continued to provide the depressurization function. In addition, the associated failure mechanism does not prevent 27AOV-101A from being operated manually.

The reactor building-to-suppression chamber vacuum breaker assemblies are not required to mitigate the consequences of any Design Basis Accident (DBA) since the maximum resulting negative differential pressure is below the design differential pressure limit of 2 psid. However, to ensure the resulting negative pressure is minimized, the reactor building-to-suppression chamber vacuum breaker assemblies are included in the design.

The reactor building-to-suppression chamber vacuum breaker assemblies serve a dual function, one of which is primary containment isolation. Since the depressurization function of the vacuum breakers would not be available if the normal TS 3.6.1.3 "Primary Containment Isolation Valves (PCIV)" Required Actions were taken, the PCIV Operability requirements of TS 3.6.1.3 are not applicable to the reactor building-to-suppression chamber vacuum breakers. Similar surveillance requirements (SRs) in TS LCO 3.6.1.6, "Reactor Building-to-Suppression Chamber Vacuum Breakers," provide assurance that the isolation capability is available without conflicting with the vacuum relief function.

TS SR 3.6.1.6.1 verifies each vacuum breaker is closed to ensure that a potential breach in the primary containment boundary is not present. Vacuum breakers that are open due to an actual differential pressure are not considered as failing this SR. As VB-6 was slightly open due to an actual differential pressure (due to slight leakage past 27AOV-101A), it was operating as designed and was not prevented from performing its primary containment isolation function.

The oxygen level in the suppression chamber remained well within the TS limit of four (4) percent volume.

All required safety functions were maintained and this event is of low safety significance.

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**EXTENT OF CONDITION**

The alternate reactor building-to-suppression chamber vacuum breaker isolation valve, 27AOV-101B, was visually inspected. The shaft was confirmed to move freely (no binding) within the manual actuator coupling block.

As part of the Extent of Condition review performed following the 2005 similar event, a total of six (6) installed Fisher butterfly valves were identified with stainless steel coupling and valve shaft configurations. All have been evaluated, and corrective actions have been identified in the Corrective Action Program. Interim actions to lubricate the manual actuator couplings on the highest priority valves have been completed.

**CORRECTIVE ACTIONS**

*Corrective Actions Completed by JAF Prior to this Report:*

1. Removed the galled manual actuator coupling block from 27AOV-101A to allow free rotation of the shaft.
2. Verified that the reactor building-to-suppression chamber vacuum breaker VB-7 Isolation Valve 27AOV-101B shaft rotates freely within the manual actuator coupling block, showing no binding exists.
3. Lubricated the manual actuator coupling on the highest priority valves.

*Actions not yet Completed:*

1. Revise applicable procedures to require a visual verification of complete valve closure following the cycling of 27AOV-101B, until the bronze bushing is installed or the manual actuator coupling block is removed.  
(Due 05/12/2006)
2. Lubricate manual coupling block for Torus Purge and Inert Supply Valves 27AOV-115 and 116.  
(Due 07/04/2006)
3. Lubricate manual coupling block for Reactor Building-to-Suppression Chamber Vacuum Breaker VB-7 Isolation Valve 27AOV-101B  
(Due 09/04/2006)
4. Install bronze bushings in the six (6) Fisher butterfly valves.  
(Due 11/30/2006)

**SAFETY SYSTEM FUNCTIONAL FAILURE REVIEW**

A review of this event determined that a safety system functional failure as defined by NEI 99-02, Revision 4, did not occur.

**SIMILAR EVENTS**

A similar valve failure (different valve function) occurred in 2005. That failure was not reportable because the condition was immediately identified due to dual position indication being displayed rather than the expected closed indication. Although that failure did not result in a reportable condition, an equipment failure evaluation was performed. Contributing causes identified following the 2005 valve failure were a combination of poor design (use of 410 stainless steel), misalignment and valve cycling frequency, with the predominant contributor determined to be valve cycle frequency. Subsequent follow-up corrective actions were prioritized based on valves with a higher frequency exercise rate. Appropriate corrective actions were generated and scheduled for completion; however, the actions had not yet been completed on 27AOV-101A.

No other similar issues were identified in previous plant Licensee Event Reports.

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**FAILED COMPONENT IDENTIFICATION**

Manufacturer: Fisher  
 Model Number: Model # 9222  
 NPRDS Manufacturer Code: F130  
 NPRDS Component Code: VACB  
 FitzPatrick Component ID: 27AOV-101A

**REFERENCES**

1. JAF Condition Report CR-JAF-2006-00979, Reactor Building-to-Suppression Chamber Vacuum Breaker VB-6 Isolation Valve 27AOV-101A Failure, dated 03/06/2006.
2. Apparent Cause Evaluation (ACE), JAF Condition Report CR-JAF-2005-00705, Failure of Torus Inner Isolation Valve 27AOV-117, dated 02/23/2005.