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**Brian R. Sullivan**  
Site Vice President – JAF

JAFP-16-0066  
April 25, 2016

United States Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555-0001

Subject: LER: 2016-002, Sticking DC Pilot in Solenoid Valve Cluster Assembly  
Results in Slow MSIV Closures  
  
James A. FitzPatrick Nuclear Power Plant  
Docket No. 50-333  
License No. DPR-59

Dear Sir or Madam:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(vii).

There are no new regulatory commitments contained in this report.

Questions concerning this report may be addressed to Mr. William Drews, Regulatory Assurance Manager, at (315) 349-6562.

Sincerely,

A handwritten signature in black ink, appearing to read "Brian R. Sullivan".

 Brian R. Sullivan  
Site Vice President

BRS/WD/mh

Enclosure: JAF LER 2016-002, Sticking DC Pilot in Solenoid Valve Cluster Assembly  
Results in Slow MSIV Closures

cc: USNRC, Region I Administrator  
USNRC, Project Manager  
USNRC, Resident Inspector  
INPO Records Center (ICES)



**LICENSEE EVENT REPORT (LER)**

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@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 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.

<b>1. FACILITY NAME</b> James A. FitzPatrick Nuclear Power Plant	<b>2. DOCKET NUMBER</b> 05000333	<b>3. PAGE</b> 1 OF 4
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**4. TITLE**  
Sticking DC Pilot in Solenoid Valve Cluster Assembly Results in Slow MSIV Closures

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
2	25	2016	2016	002	00	4	25	2016	N/A	N/A
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: <i>(Check all that apply)</i>			
<b>1</b>	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. POWER LEVEL	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A	

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT Mr. William Drews, Regulatory Assurance Manager	TELEPHONE NUMBER <i>(Include Area Code)</i> 315-349-6562
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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	JM	FSV	A613	N					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH	DAY	YEAR
<input type="checkbox"/> YES <i>(If yes, complete 15. EXPECTED SUBMISSION DATE)</i>	<input checked="" type="checkbox"/> NO			

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

On January 23, 2016, James A. FitzPatrick Nuclear Power Plant (JAF) initiated a manual Scram in response to lowering screenwell water level due to frazil ice blockage, and subsequently closed the Main Steam Isolation Valves (MSIV). A post Scram review identified that MSIV 29AOV-86B closed slowly. On January 26, 2016, testing per ST-1B identified that MSIV 29AOV-86C closed slowly. In both cases, the inboard MSIVs performed satisfactorily.

Troubleshooting identified that the problem originated in the solenoid valve cluster assemblies (SVCA) and they were replaced and tested successfully. A failure analysis was performed by Exelon PowerLabs on the SVCAs. On February 25, 2016, the Exelon PowerLabs analysis concluded that the DC pilot valves, 29SOV-86B3 and 29SOV-86C3, exhibited slow vent times. Additional corrective actions include changing the preventative maintenance frequency from 8 years to 6 years and initiating further investigation through the component's vendor.

Two MSIVs exceeded the closing time of Technical Specification Surveillance Requirement (SR) 3.6.1.3.6. This condition caused two independent channels of a system used to control the release of radioactive material to become inoperable; reportable per 10 CFR 50.73(a)(2)(vii).

NRC FORM 366A  
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018



## LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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James A. FitzPatrick Nuclear Power Plant	05000 – 333	2016	– 002	– 00

### NARRATIVE

#### Background

James A. FitzPatrick Nuclear Power Plant (JAF) has four main steam lines [EIS identifier: SB] between the reactor and the main turbine [TA]. These lines are designed to isolate in the event of design basis accidents. In the event of a main steam line break, the isolation prevents further radiological release. In the event of a loss of coolant (LOCA) accident, they isolate to maintain coolant inside of containment.

Two isolation valves are provided in series in a horizontal run of each main steam line, as close as practical to the primary containment. One inside (inboard) and the other outside (outboard) together form part of the primary containment barrier for Reactor Coolant System breaks inside the containment and part of the Reactor Coolant Pressure Boundary for main steam line breaks outside the primary containment.

The closure time of the main steam isolation valves (MSIVs) is a significant variable from a radiological standpoint. The MSIVs are required to close within 3 to 5 seconds after signal generation. The closure speed is designed to be slower than 3 seconds in order to lessen the pressure transient caused by an inadvertent simultaneous closure of all steam lines. The closure speed is designed to be faster than 5 second to minimize the release of fission products to the environment and retain reactor coolant.

Each MSIV is controlled by a solenoid valve cluster assembly (SVCA). There are three solenoid valves within the SVCA; AC Pilot solenoid valve, AC Test solenoid valve and a DC pilot solenoid valve. These three solenoids port air to and from other control valves. The normally energized AC pilot valve and DC pilot valve must move to the de-energized position to change the position of the 2 and 4 way valves which closes the MSIV. When both solenoids are de-energized, the below piston operator space is vented.

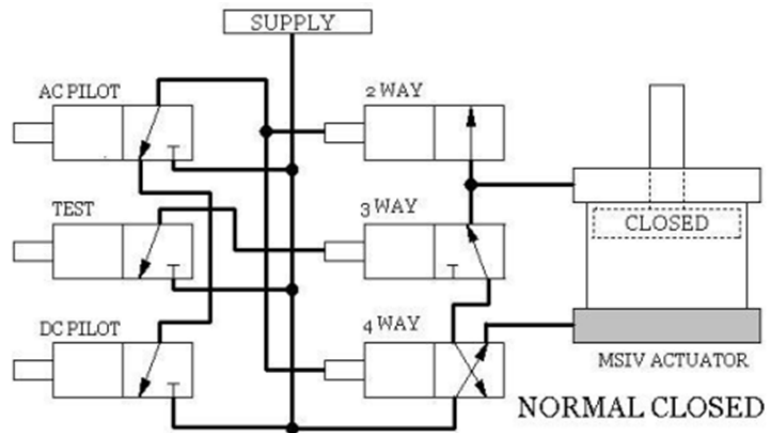
Simultaneously, the above piston operator space is pressurized, thus assisting the spring in closing the MSIV.

This licensee event report (LER) addresses a slow closure response for outboard MSIV 29AOV-86B and 29AOV-86C due to their DC pilot solenoid valves 29SOV-86B3 and 29SOV-86C3.

#### Event Description

On January 23, 2016, control room Operators inserted a manual Scram due to lowering intake levels resulting from frazil ice conditions in Lake Ontario. As part of the plant shutdown the MSIVs were closed. The closing time for the "B" outboard MSIV 29AOV-86B, was slow by as much as 9 seconds after the other valves indicated closed. The SVCA and 4-way valve were replaced and 29AOV-86B then stroked satisfactorily.

On January 27, 2016, the MSIV fast closure test ST-1B was performed on all MSIVs. MSIV 29AOV-86C closed in 6.9 seconds and all other MSIVs tested satisfactorily. The SVCA and 4-way valve were replaced and 29AOV-86C then stroked satisfactorily.



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### Event Analysis

On January 27, 2016, 29AOV-86C was taken closed using the slow close push button; the manual control switch was then taken from “Auto-open” to “closed”. At this point, Operators released the slow close push button and the expected response was that the valve would remain closed. It temporarily drifted open and then reclosed. This can occur because both the AC and DC solenoids need to deenergize in order to close the MSIVs. If either the AC or DC solenoids stick in their seats the 2-way and 4-way valves would be positioned to port instrument air to the underside of the MSIV actuator piston causing the valve to open.

A failure analysis on the SVCA for MSIVs 29AOV-86B and 29AOV-86C was conducted by Exelon PowerLabs and the results were delivered to JAF on February 25, 2016, in report ENT-40072. The only anomaly discovered was that both DC pilots in the SVCAs exhibited slow average vent times of 4.94-seconds for 29SOV-86B3 and 1.95-seconds for 29SOV-86C3 instead of an instantaneous actuation. A momentarily ‘stuck’ AC or DC solenoid could explain an increase in MSIV stroke time. However, the Exelon PowerLabs tests confirm that the AC solenoid consistently stroked to relieve air pressure instantaneously while the DC solenoid exhibited a delay.

The slow DC pilot valve responses affected the required closing time in two MSIVs. This condition caused two independent channels of a system used to control the release of radioactive material to become inoperable; reportable per 10 CFR 50.73(a)(2)(vii).

### Cause

The common cause of the delayed closure of MSIVs 29AOV-86B and 29AOV-86C was “sticking” of DC solenoid valves 29SOV-86B3 and 29SOV-86C3.

### Similar Events

#### Internal

The ST-1B MSIV fast closure testing and results are trended by the IST Program. Prior to this event there were two recent instances where MSIV closing time was greater than 5 seconds at JAF.

CR-JAF-2014-04335 - Close time on 29AOV-86B was 5.5 seconds during ST-1B testing. The apparent cause was high resistance in an electrical contact for the MSIV pilot closure logic.

CR-JAF-2008-01147 - Close time on 29AOV-86C was 43.12 seconds during ST-1B testing. The apparent cause was attributed to contamination introduced through the instrument air system into the 4-way valve.

#### External

Limerick Generating Station, Unit 1, LER-2012-001 – Three MSIVs failed hot closing stroke time due to issues with testing accuracy.

Quad Cities Nuclear Power Station, Unit 1, LER-2013-002 – Four outboard MSIVs failed to close within 5 seconds because the actuator seals had degraded due to age and wear.

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(11-2015)

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### FAILED COMPONENT IDENTIFICATION:

Manufacturer:	Automatic Valve Corp
Manufacturer Model Number:	AV 6910-075
NPRDS Manufacturer Code:	A613
NPRDS Component Code:	FSV
FitzPatrick Component ID:	29SOV-86B3 and 29SOV-86C3

### Corrective Actions

#### Completed Actions

- SVCAs were replaced and both MSIVs were tested successfully.

#### Future Actions

- MSIV SVCA Preventative Maintenance (PM) frequency change from 8 years to 6 years
- Vendor is investigating the DC pilot solenoid failures and additional corrective actions will be based on the results.

### Safety Significance

There was no actual radiological or nuclear safety consequence during this event.

Two isolation valves in each main steam line close automatically to prevent fuel damage by limiting the loss of reactor coolant in the case of a major steam system leak, and to limit the release of radioactive materials by isolating the primary containment. Valve stroke time is required to be short enough to limit the release of radioactive material in accordance with accident analyses. A maximum MSIV closure time of 10.5 seconds would limit the total amount of liquid and steam lost from the primary system to prevent core damage, and this closure time will ensure that any radiological doses are well below the guidelines set forth in 10 CFR 100.

This deficiency only affected two outboard MSIVs. In both cases, the inboard MSIVs performed satisfactorily. Therefore, all main steam lines were able to perform their intended safety function to isolate.

### References

- Condition Report: CR-JAF-2016-00263, 29AOV-86B Slow Closure
- Condition Report: CR-JAF-2016-00324, 29AOV-86C Slow Closure
- Exelon PowerLabs Report: ENT-40072, Failure Analysis on MSIV Solenoid Valve Cluster Assemblies 29AOV-86B and 29AOV-86C
- FSAR-JAF-4.6, Main Steam Line Isolation Valves