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**Stephenie L. Pyle**  
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Arkansas Nuclear One

**10 CFR 50.73**

1CAN081805

August 10, 2018

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

Subject: Licensee Event Report 50-313/2018-003-00  
Arkansas Nuclear One, Unit 1  
Docket No. 50-313  
License No. DPR-51

Dear Sir or Madam:

Pursuant to the reporting requirements of 10 CFR 50.73, attached is the subject Licensee Event Report concerning the manual trip due to a turbine bypass valve failing open at Arkansas Nuclear One, Unit 1.

There are no new commitments contained in this submittal.

Should you have any questions concerning this issue, please contact me at 479-858-4704.

Sincerely,

**ORIGINAL SIGNED BY DAVID B. BICE FOR STEPHENIE L. PYLE**

SLP/dkb

Attachment: Licensee Event Report 50-313/2018-003-00

cc: Mr. Kriss Kennedy  
Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region IV  
1600 East Lamar Boulevard  
Arlington, TX 76011-4511

NRC Senior Resident Inspector  
Arkansas Nuclear One  
P.O. Box 310  
London, AR 72847

Institute of Nuclear Power Operations  
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**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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 e-mail to [Infocollects.Resource@nrc.gov](mailto: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> Arkansas Nuclear One, Unit 1	<b>2. DOCKET NUMBER</b> 05000-313	<b>3. PAGE</b> 1 OF 5
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**4. TITLE**  
Manual Trip due to Turbine Bypass Valve Failing Open

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
06	16	2018	2018	003	00	08	10	2018	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 §: (Check all that apply)			
1	<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 checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. POWER LEVEL  2%	<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 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 Stephenie L. Pyle, Manager, Regulatory Assurance	TELEPHONE NUMBER (Include Area Code) (479) 858-4704
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO ICES	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO ICES
B	SO	FCV	F130	Y	N/A	N/A	N/A	N/A	N/A

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

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

On June 16, 2018, Arkansas Nuclear One, Unit 1 (ANO-1), performed a manual reactor trip due to a Turbine Bypass Valve (TBV) failing open during reactor startup. The copper instrument tubing, which connects the positioner output to the top of the TBV cylinder booster, was found broken at the tubing ferrule. The instrument tubing failure was determined to be due to high cycle fatigue and vibration. The root cause of this event was determined to be the instrument air copper tubing had less than adequate robustness for the TBV system high vibration application. Corrective actions include replacement of the tubing and fittings with stainless steel and flex-lines for the four ANO-1 TBVs during the next scheduling refueling outage.

This event had no effect on the public health and safety. The event was reported to the Nuclear Regulatory Commission on June 16, 2018 via Event Notification 53459.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One, Unit 1	05000-313	2018	- 003	- 00

**NARRATIVE**

**A. Plant Status**

At the time this condition was identified, Arkansas Nuclear One, Unit 1 (ANO-1), was performing a reactor startup from a planned refueling outage and operating at approximately 2% power. No structures, systems or components were out of service at the time of this event that contributed to the event.

**B. Background – System Design**

A set of four (4) Turbine Bypass Valves (TBVs) [FCV] with a combined capacity of 15% power (3.75% power each) are used to remove excess heat from the reactor at low power when the Main Turbine Generator is not in operation. Each Once Through Steam Generator (OTSG) has 2 TBVs, and the pair individually control the respective OTSG at the Steam Generator Header pressure designated setpoint if in automatic, or at the Operator desired setpoint if being controlled in manual.

The Unit 1 Reactor, Feedwater, and Turbine Systems are controlled by an Integrated Control System (ICS) that allows for operation in an automatic or manual mode. ICS monitors several of its inputs via a Smart Automatic Signal Selector System and alerts the Operator if a mismatch in signals is detected, and has the ability to automatically transfer controlling functions to the “good” input if certain parameters are met.

During normal lower power operation prior to synchronizing the Main Turbine to the grid, the TBVs are operated in automatic and cycle as needed to maintain each OTSG pressure at a setpoint of approximately 895 psig. As power is raised, the TBVs open further until the Main Turbine is synchronized to the grid, at which time the TBVs will close and remain closed throughout power escalation.

**C. Event Description**

On June 16, 2018, at approximately 1122 CDT during ANO-1 reactor startup from a scheduled refueling outage (1R27), ANO-1 ‘B’ OTSG to the ‘A’ Main Condenser TBV CV-6687 failed to in the full open position with the reactor in Mode 2 and approximately 2% power. The TBV failed open due to failure of the valve positioner’s copper instrument air tubing. This created an additional steam demand which resulted in Reactor Coolant System temperature lowering and, subsequently, lowering pressurizer level. Pressurizer level continued to lower to less than 100 inches which met the criterion for a manual reactor trip in accordance with Operating Procedure 1202.001, “Reactor Trip.”



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**NARRATIVE**

At 1126 CDT, Operations manually tripped the reactor from approximately 4% power. Operations transitioned to Operating Procedure OP-1202.003, "Overcooling," due to meeting entry criteria on lowering OTSG pressure and RCS temperature. The overcooling was terminated by Main Steam Line Isolation (MSLI) actuation when the "B" OTSG pressure reached 600 psig, resulting in closure of both Main Steam Isolation Valves. The plant was placed in a stable condition utilizing Emergency Feedwater and the Atmospheric Dump Valves.

The failed tubing and fittings on CV-6687 were replaced with stainless steel following the failure via Work Order 503935.

This event was reported to the Nuclear Regulatory Commission on June 16, 2018 via Event Notification 53459 based on meeting the reporting criteria of 10 CFR 50.72(b)(2)(iv)(B) due to Reactor Protection System (RPS) Actuation (scram) and 10 CFR 50.72(b)(3)(iv)(A) for specified system actuation.

**D. Event Cause**

The direct cause of this event was vibration induced high cycle fatigue failure in the TBV CV-6687 instrument copper tubing at the compression fitting. This cause is supported by the Failure Analysis.

The root cause of this event was determined to be the instrument air copper tubing had less than adequate robustness for the TBV system high vibration application.

A contributing cause of this event was insufficient controls over the rerouting of instrument air tubing with consideration of vibration induced fatigue failure.

**E. Corrective Actions**

Actions to address the direct cause included a walk down of the associated piping supports of all TBVs by Engineering and Maintenance personnel. The walk down did not identify a deficiency or degradation of influence related to piping vibration.

Actions to address the root cause include replacement of the tubing and fittings on CV-6687 with stainless steel and flexible hose. This corrective action is also being applied to all four (4) ANO-1 TBVs (CV-6687, CV-6888, CV-6689, and CV-6690) during the next scheduled refueling outage (1R28). These actions are included in the corrective action program.

Actions to address the aforementioned contributing cause include the generation of guidance documents for the installation/rerouting of non-safety related equipment such as instrument air piping, ventilation ducting, and electrical cabling.



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**NARRATIVE**

The extent of condition review included tubing and fitting inspection for condition and tightness of the three other ANO-1 turbine bypass valves. Air leakage on one TBV was identified and the condition was corrected on June 18, 2018. No issues were identified on the other two turbine bypass valves.

**F. Safety Significance Evaluation**

The actual safety consequences of this event included a manual reactor trip from approximately 4% power. Systems and components operated as designed following the reactor trip and the subsequent MSLI actuation. The impact of the manual trip on risk was evaluated and determined to be below the screening criterion for risk significance.

There were no actual consequences to the general safety of the public, nuclear safety, industrial safety and radiological safety for this event.

**G. Basis for Reportability**

An eight-hour non-emergency notification was reported to the NRC via Event Notification 53459 on June 16, 2018. The basis for that notification was the requirements listed in 10 CFR 50.72(b)(2)(iv)(B) (RPS actuation) and 10 CFR 50.72(b)(3)(iv)(A) (specified system actuation).

This event is reported pursuant to the following criteria:

10 CFR 50.73(a)(2)(iv)(A) states, in part:

Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section;

10 CFR 50.73(a)(2)(iv)(B) states, in part:

The systems to which the requirements of paragraph (a)(2)(iv)(A) of this section apply are:

(1) Reactor protection system (RPS) including: reactor scram or reactor trip.



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**NARRATIVE**

H. Additional Information

A review of the ANO corrective action program and Licensee Event Reports for the previous three years was performed. One event was identified (CR-ANO-1-2016-0276). This was an ANO-1 event that occurred on January 21, 2016, which involved the 'A' OTSG Turbine Bypass Valve failing full open when an instrument airline connection to the positioner separated. The ANO-1 Load Demand Hand/Auto Station was promptly placed in Manual and power was lowered to maintain heat balance power less than 100%. The direct cause of CV-6689 failing full open was the copper instrument air line breaking at the fitting due to improper installation.

Energy Industry Identification System (EIIIS) codes and component codes are identified in the text of this report as [XX].