FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Lew W. Myers
Chief Operating Officer

419-321-7599
Fax 419-321-7582

NP-33-03-001-00

Docket No. 50-346

License No. NPF-3

March 31, 2003

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

Ladies and Gentlemen:

LER 2003-001-00
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – January 30, 2003

Enclosed please find Licensee Event Report 2003-001, which is being submitted to provide written notification of potential inability of air-operated valves to function during design basis conditions. This issue was identified during development and implementation of an Air-Operated Valve Reliability Program as previously committed in Licensee Event Report 2002-004. Commitments associated with this LER are listed in the Attachment.

Very truly yours,

Lew W Myers

GMW/s

Enclosures

cc: Mr. J. E. Dyer, Regional Administrator, USNRC Region III
Mr. C. S. Thomas, DB-1 NRC Senior Resident Inspector
Utility Radiological Safety Board

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COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station in this document. Any other actions discussed in the submittal represent intended or planned actions by Davis-Besse. They are described only as information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
1. Install proper sized air accumulators for valves CC1467, CC1469, and CC1495.	1. Prior to startup
2. Install a new valve actuator capable of closing the valve MU3 against the maximum differential pressure.	2. Prior to startup
3. Submit results of safety significance evaluation in revision to Licensee Event Report.	3. Prior to startup

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

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 Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U S Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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)

1. FACILITY NAME	2. DOCKET NUMBER	3 PAGE
Davis-Besse Unit Number 1	05000346	1 OF 5

4. TITLE

Potential Inability of Air-Operated Valves to Function During Design Basis Conditions

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	30	2003	2003	-- 001 --	00	03	31	2003		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9 OPERATING MODE	D
10 POWER LEVEL	000

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	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	TELEPHONE NUMBER (Include Area Code)
Gerald M. Wolf, Staff Engineer - Licensing	(419) 321-8114

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

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE).		NO		05	19	2003

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

On January 30, 2003, with the reactor defueled, it was determined that several air-operated valve (AOV) actuators had negative operating margins. After further review, it was determined that four valves were not capable of performing their designated safety functions for all required conditions. Valves CC1467 and CC1469, Decay Heat Removal Heat Exchanger Outlet Isolation Valves, may not fully open upon a loss of non-safety grade instrument air because their associated air accumulators are undersized. Similarly, CC1495 may not fully close to isolate cooling water flow to non-essential equipment on a loss of instrument air because the air accumulator was also undersized. Larger air accumulators are being installed on all three of these valves. Valve MU3 may not close against maximum Reactor Coolant System pressure to isolate letdown flow from inside containment, but would close against normal system pressure. A new actuator is being installed to allow MU3 to close against maximum Reactor Coolant System pressure. These conditions, apparently caused due to improper sizing of air-operated valve actuators and accessories during initial design, are being reported in accordance with 10CFR50.73(a)(2)(i)(B) as operation or condition prohibited by the Technical Specifications.

LICENSEE EVENT REPORT (LER)

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

DESCRIPTION OF OCCURRENCE:

On January 30, 2003, with the reactor defueled, it was determined that several air-operated valve (AOV) actuators had negative operating margins. System and component design basis calculations are being performed and reviewed as part of the development and implementation of an AOV Reliability Program as previously committed in Davis-Besse Nuclear Power Station (DBNPS) Licensee Event Report 2002-004. After review, it was determined that valves CC1467, CC1469, CC1495, and MU3 were not capable of performing their designated safety functions for all required conditions during past plant operation. A description of each of these valves is given separately below.

The Safety Features Actuation System (SFAS) [JE] at the DBNPS is designed to automatically prevent or limit fission product and energy release from the core, to isolate the containment vessel [NH] and to initiate the operation of the engineered safety features equipment in the event of a loss-of-coolant accident. The SFAS also initiates protective actions in the event of a Steam line break inside of Containment.

The Component Cooling Water (CCW) System [CC] circulates water through a closed cooling loop to provide cooling water to safety-related equipment and reactor auxiliary equipment within the Auxiliary [NF] and Containment Buildings, transferring the heat through the CCW heat exchangers [CC-HX] to the ultimate heat sink [BS] (Lake Erie) via the Service Water System [BI]. The system pressure is set by the CCW Surge Tank [CC-TK] located upstream of the CCW Pumps [CC-P]. During a Design Basis Accident supply to non-essential components is isolated and cooling water is supplied only to essential components, including the Emergency Diesel Generator Jacket Cooling Water Heat Exchangers [LB-HX], Decay Heat and High Pressure Injection Pump Bearing Coolers [BP-P-CLR/BQ-P-CLR], and the Decay Heat Removal Heat Exchangers [BP-HX].

Valves CC1467 and CC1469 are the Decay Heat Removal Heat Exchanger Component Cooling Water (CCW) Outlet Isolation Valves [BP-HX-ISV]. These 18-inch butterfly valves are closed during normal power operations, and are opened during plant shutdowns to provide CCW flow through the Decay Heat Removal Heat Exchangers. These valves open automatically on an SFAS Level 3 signal on low-low Reactor Coolant System pressure of $\leq$ 400 psig or high Containment pressure of $\geq$ 18.7 psia to allow for cooling of the water removed from containment by the Low Pressure Injection System via the emergency sump. These valves are also designed to fail open upon a loss of instrument air to ensure a flow path is available. However, calculations showed that the 260 cubic inch safety-grade air accumulators [ACC] installed at the valves to provide a source of motive power in the event of a loss of non-safety grade instrument air [LD] are undersized. The available air volume would permit the valves to begin to open, but the valves may not fully open in the event of a loss of instrument air, potentially resulting in reduced cooling water flow to the Decay Heat Removal Heat Exchangers.

DESCRIPTION OF OCCURRENCE: (Continued)

Valve CC1495 is the CCW Auxiliary Building Non-Essential Header Isolation Valve. This 16-inch butterfly valve is normally open to provide cooling water to non-essential components such as the Spent Fuel Pool Heat Exchangers [DA-HX], Reactor Coolant Pump Seal Return Coolers, Reactor Coolant System Sample Cooler, Post-Accident Sample Coolers, Pressurizer Quench Tank Cooler, and various Clean Liquid, Miscellaneous Liquid, and Gaseous Radwaste System [WE] components. On an SFAS Level 3 signal, this valve closes to isolate non-essential loads and ensure that cooling water is available for Engineering Safety Features components. This valve also closes on low level in the CCW Surge Tank or upon a loss of instrument air to ensure sufficient flow is available to essential equipment. However, similar to valves CC1467 and CC1469 above, calculations showed that the 328 cubic inch safety-grade air accumulator installed at the valve to provide a source of motive power in the event of a loss of non-safety grade instrument air is undersized. The available air volume may not ensure the valve would fully close in the event of a loss of instrument air on an SFAS Level 3 signal or a low CCW Surge Tank level.

Valve MU3 is the Reactor Coolant System Letdown Outlet Isolation Valve. This 2.5-inch gate valve is normally open to allow letdown flow to pass from the Letdown Coolers to the purification demineralizers. A small portion of the Reactor Coolant System is letdown for purification, chemical control, and degasification purposes during normal plant operation. This isolation valve closes on an SFAS Level 2 on low Reactor Coolant System pressure of $\leq$ 1600 psig or high Containment pressure of $\geq$ 18.7 psia to isolate letdown flow as well as to provide for containment isolation. This valve is also designed to fail closed upon a loss of instrument air. However, calculations performed showed that the isolation valve may not close against a maximum Reactor Coolant System pressure of 2500 psig.

APPARENT CAUSE OF OCCURRENCE:

Lessons learned from the nuclear power industry's motor-operated and air-operated valve programs has determined that many AOV actuators were purchased undersized. This was a result of vendors being provided with inaccurate system conditions in combination with less than conservative sizing methodology used at the time, and a lack of formal calculations supporting the design basis and appropriate actuator settings for AOV actuators. There was also the practice of sizing AOV actuators with little built-in margin. Similar analytical deficiencies resulted in the design of the air accumulators used to provide a source of motive power in the event of a loss of non-safety grade instrument air were not large enough to ensure the valves would perform their safety function under design conditions.

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

ANALYSIS OF OCCURRENCE:

At the time of discovery there were no Technical Specification operability requirements for the affected systems with the reactor defueled. However, the plant operated in this condition when the Decay Heat/Low Pressure Injection System was required to be operable per DBNPS Technical Specification (TS) 3.5.2 and TS 3.5.3, the Component Cooling Water System was required to be operable per TS 3.7.3.1, and Containment Isolation Valves were required to be operable per TS 3.6.3.1. Therefore, this issue represents a condition prohibited by the Technical Specifications, and so is reportable in accordance with 10CFR50.73(a)(2)(i)(B).

While the Reactor Coolant System Letdown Outlet Isolation Valve (MU3) may not have closed against a maximum Reactor Coolant System pressure of 2500 psig, the valve would have closed under normal operating conditions. Calculations show the valve would have closed against a differential pressure of 2180 psig, and with normal operating pressure of the Reactor Coolant System at approximately 2155 psig, the expected differential pressure would have been approximately 2100 psig. If a leak in the Reactor Coolant System caused pressure to decrease to the SFAS Level 2 actuation setpoint of 1600 psig, MU3 would have closed to perform its safety function of isolating containment and Reactor Coolant System Letdown flow. Additionally, valve MU2A is located outside of containment in compliance with General Design Criteria 55 to isolate letdown flow upon receipt of the same SFAS Level 2 signal. This motor-operated valve remained fully capable of isolating letdown flow at any postulated Reactor Coolant System pressure due to a low Reactor Coolant System pressure or high containment pressure.

The Decay Heat Removal Heat Exchanger Component Cooling Water Outlet Isolation Valves (CC1467 and CC1469) may not have fully opened when required in response to an SFAS Level 3 signal in conjunction with a loss of non-safety grade instrument air. However, the valves would have partially opened with the amount of air available in the accumulators, allowing a portion of the required cooling water flow through the Decay Heat Removal Heat Exchangers.

The Component Cooling Water Auxiliary Building Non-Essential Isolation Valve CC1495 may not have fully closed in the event of a loss of non-safety grade instrument air in conjunction with either an SFAS Level 3 signal or a low Component Cooling Water Surge Tank level. In the event of a low level in the Component Cooling Water Surge Tank, motor-operated valves CC5096 and CC5097 also receive a closure signal, and these two valves would then isolate the non-essential header to isolate the leak.

Evaluations into the safety significance of these deficiencies are ongoing, and the results of these evaluations will be reported in a revision to this Licensee Event Report.

CORRECTIVE ACTIONS:

An AOV Reliability Program is being implemented, in part, to ensure that AOV actuator sizing and setpoints are reviewed to verify and document their adequacy. As previously committed in DBNPS LER 2002-004, for all Category 1 and 2 AOVs and their associated components, the design basis requirements, including the correct installed orientation, will be established in accordance with the AOV Reliability Program Manual. The requisite engineering documents will be developed to implement any required changes. Any modifications needed to restore these components to their design requirements will be completed prior to plant restart. Post-modification testing will be performed to verify compliance with design bases.

For valves CC1467, CC1469, and CC1495, modifications are being developed to install the proper sized air accumulator. For valve MU3, a modification is being implemented to install a new valve actuator capable of closing the valve against the maximum differential pressure. The modifications to all four valves will be implemented prior to plant startup.

FAILURE DATA:

DBNPS LER 2002-004 documents similar problems discovered with air-operated valves for which the actuators did not have the capability to properly position the associated valve for all postulated conditions. It was during the performance of the corrective actions as stated in LER 2002-004 that the problems associated with the four valves described above were discovered.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

NP-33-03-001-00 CRs 03-00830, 03-01040, 03-01253