FirstEnergy®

Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, Ohio 43449-9760

NP-33-02-004-00

Docket No. 50-346

License No. NPF-3

July 22, 2002

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

Ladies and Gentlemen:

LER 2002-004
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – May 23, 2002

Enclosed please find Licensee Event Report 2002-004, which is being submitted to provide written notification of the subject occurrence. This LER is being submitted in accordance with 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(vii).

Very truly yours,

J. Randel Fast
Plant Manager
Davis-Besse Nuclear Power Station

PSJ/s

Enclosure

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

IE22

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
For valves MU66A-D, MU38, and all other Category 1 and 2 Air Operated Valves (AOVs) and their associated components; establish the design basis requirements, including the installed orientation, in accordance with the AOV Reliability Program Manual.	Prior to plant restart
Develop the requisite engineering documents, including post-modification testing requirements, to implement and verify the required design bases for MU66A-D, MU38, and all other Category 1 and 2 AOVs.	Prior to plant restart
Review and revise as necessary drawing 7749-M525-37-7 to ensure the actual configuration and valve body arrow shown on the drawing are correct.	Prior to plant restart
Review design control program and revise as necessary in accordance with Return to Service Plan to ensure the quality and technical adequacy of plant design changes.	Prior to plant restart

NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)

Containment Isolation Closure Requirements for RCP Seal Injection Valves MU66A-D

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
05	23	2002	2002	-- 004 --	00	07	22	2002		05000
									FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	6
POWER LEVEL (10)	000

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

	20.2201(b)		20.2203(a)(3)(i)		50.73(a)(2)(i)(C)	X	50.73(a)(2)(vii)
	20.2201(d)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(A)
	20.2203(a)(1)		20.2203(a)(4)		50.73(a)(2)(ii)(B)		50.73(a)(2)(viii)(B)
	20.2203(a)(2)(i)		50.36(c)(1)(i)(A)		50.73(a)(2)(iii)		50.73(a)(2)(ix)(A)
	20.2203(a)(2)(ii)		50.36(c)(1)(ii)(A)		50.73(a)(2)(iv)(A)		50.73(a)(2)(x)
	20.2203(a)(2)(iii)		50.36(c)(2)		50.73(a)(2)(v)(A)		73.71(a)(4)
	20.2203(a)(2)(iv)		50.46(a)(3)(ii)		50.73(a)(2)(v)(B)		73.71(a)(5)
	20.2203(a)(2)(v)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(C)		OTHER
	20.2203(a)(2)(vi)	X	50.73(a)(2)(i)(B)		50.73(a)(2)(v)(D)		Specify in Abstract below or in NRC Form 366A

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Peter S. Jordan, Engineer - Licensing	(419) 321-8260

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

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)

On May 23, 2002, with the reactor in Mode 6, it was determined that the pressure regulating valve setpoint for the Reactor Coolant Pump (RCP) Seal Injection Valves (MU66A-D) was inadequate to ensure closure of the valves upon receipt of a containment isolation signal. This condition represents a potential common-mode failure. As the result of this condition, during postulated accident conditions, a potential pathway for uncontrolled radioactive leakage outside containment could be created. This condition has apparently existed since original plant construction. This condition is a violation of Technical Specification 3.6.3.1 for Modes 1-4. In addition, the valves were determined to be installed inconsistent with design assumptions. The causes of these conditions are less than adequate design interface communication and design control. Design basis requirements for Category 1 and 2 Air Operated Valves (AOVs) and their associated components will be established in accordance with the AOV Reliability Program Manual. MU66A-D, MU38, and all other Category 1 and 2 AOVs will be verified to conform to their design basis requirements or component modifications will be made to restore conformance with design basis requirements.

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

DESCRIPTION OF OCCURRENCE:

On May 23, 2002, with the reactor in Mode 6, routine scheduled maintenance of the Reactor Coolant Pump (RCP) Seal Injection (outside containment) Isolation Valves MU66A-D [CB-ISV] was being performed which caused Engineering personnel to question the thrust requirement to close the valves. Information presented in an industry-prepared Joint Owners Group Air Operated Valve Operability Program issued in 2001 led licensee personnel to review and question engineering data for the valves. This activity concluded that the setpoint for the pressure regulating valves was inadequate to ensure closure of the valves upon receipt of a Safety Features Actuation System (SFAS) [JE] Level 3 actuation. This condition is considered to be a common mode failure. With the Seal Injection Makeup Pump not operating and Reactor Coolant System (RCS) at operating pressure, the valve actuators may not be able to close the isolation valves. However, downstream of these isolation valves are check valves MU242-245 [CB-ISV] (one per injection line) that are designed to prevent flow out of the RCS, thereby isolating the flow path regardless of whether the RCP Seal Injection air operated valves (AOVs) are closed. A single failure of one of these check valves, which is an accident assumption, could result in an unisolated 1-1/2 inch line out of containment following an SFAS Level 3 actuation. This postulated backflow through the makeup piping would represent an inter-system Loss of Coolant Accident (ISLOCA).

The MU66 valves are 1-1/2 inch Velan globe valves, Model W7-374-13MS. Their 12 inch actuator is manufactured by Kieley & Mueller, Model 45CSRD.

As described in USAR Section 9.3.4.3.3, the four RCP Seal Injection lines each contain a check valve inside containment and a solenoid actuated pneumatic valve outside containment in order to meet the containment isolation provisions of 10 CFR 50, Appendix A, GDC-55. Configuration of valves MU66A-D to meet their design bases assumes system flow under the valve disk during normal operation. During the postulated accident condition, the design bases assume RCS pressure acting on the top of the valve disk. The as-found configuration, shown in Figure 1, results in normal and accident system flow to be the converse of the design bases.

As part of the maintenance activity, one of the MU66 valves was disassembled and inspected. Its installed configuration was determined to be inconsistent with design assumptions. For a postulated accident situation resulting in an SFAS Level 3 containment isolation signal with the makeup pump not operating, the valves were intended to be installed such that RCS pressure would act upon the top of the valve disk, thus assisting valve closure when the valve is subjected to full differential pressure. In the as-found configuration, RCS pressure acts upon the bottom of the valve disk, thus acting to open the valve when subjected to full differential pressure.

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DESCRIPTION OF OCCURRENCE (continued):

In order to prevent unnecessary loss of seal injection flow and possible RCP seal damage during normal operation, the valves are designed to remain open upon loss of instrument air supply. An air accumulator provides the necessary pressure to keep the valve open. Even if this air pressure were lost, the system design assumes Seal Injection pressure would be exerted under the valve disk, thereby keeping the valve open. However, with the as-found configuration, RCP Seal Water Injection System pressure would serve to close the valves, contrary to their design bases.

Notwithstanding the orientation of the valves, the present 46 psig setpoint for the valve actuators' pressure regulating valves would not ensure valve closure upon receipt of the containment isolation signal. This is not consistent with postulated accident assumptions. Calculations dating back to plant construction to define the operational requirements for the valves were determined to be incorrect, resulting in an inaccurate thrust requirement. In their currently installed configuration, the valves have negative margin to close in order to satisfy their safety function.

On July 5, 2002, the RCP Seal Return Valve (MU-38) [CB-ISV] was also determined to be misoriented. MU38 is the outside containment isolation valve which is protected by motor-operated isolation valves (MU59A-D) [CB-ISV] inside containment. MU38 is assumed to be closed by spring pressure in the event of failure of the air supply. In the intended configuration, RCS pressure over the valve disk may have been assumed to assist the spring force to close the valve. Based on engineering judgment, it is believed the spring is capable of its intended function with the valve misoriented, but because this has not been verified, the valve was conservatively declared inoperable and is included in this Licensee Event Report.

It was determined that no system level or component level calculation has been performed to verify the adequacy of the pressure regulating valve settings to ensure actuator closure of the MU66A-D valves upon receipt of an SFAS Level 3 signal irrespective of their installed configuration.

APPARENT CAUSE OF OCCURRENCE:

Inadequate Settings for Pressure Regulating Valves

During original plant construction, a formal calculation supporting the design basis and appropriate actuator settings could not be identified. During plant pre-operational testing, failure of the stem to actuator connection occurred because the valve stem threaded connection was undersized. To reduce thrust forces on the valve stems, it was decided in 1977 to add a pressure regulating valve (PRV) [CB-AFRG] between the air accumulator and the valve actuator. Based on a March 1, 1977 Field Change Authorization, the PRV for MU66A-D was set at 46 psig vice 75 psig pressure at the accumulator. The basis for this value is unknown, although it appears to be predicated on this Field Change

APPARENT CAUSE OF OCCURRENCE (continued):

Authorization. This 46 psig setpoint will not ensure valve closure under design conditions as described in USAR Section 9.3.4.3 regardless of the installed conditions.

Valve Misorientation

The cause of the misorientation of the RCP Seal Water Injection Isolation Valves (MU66A-D) and RCP Seal Return Valve (MU38) appears to have resulted from confusion and/or miscommunication during original construction-phase installation of the valves. No documented information could be found related to the actual field instructions for installation of the valves. The valves were manufactured depicting a flow arrow on the body of the valve which would conform to normal generic system flow path for a globe valve (i.e., flow under the valve disk). The flow arrows shown on the installation drawing (pointing away from containment) were apparently intended to depict flow direction from the RCP seals assumed for postulated accident conditions without including any special notes or cautions on the drawing to explain or emphasize the intended valve configuration. The valves were installed such that the flow arrows on the valve bodies were matched to the flow arrows on the installation drawing which resulted in assumed post-accident RCS flow from the RCP seals to be under the disks for all the valves which is contrary to design intent. Documentation during and after plant construction indicates that the valves should be installed such that RCS pressure would act on the top of the valve disk. The installed configuration is inconsistent with this recommendation, USAR Sections 6.2.4 and 9.4.3.3, and the response to USAR Question 9.3.6.

There apparently was less than adequate design interface communication at the time of and subsequent to original valve installation. The intent of the flow arrows on the installation drawing was not properly correlated to specific design intent and valve orientation. The uniqueness of the design was not made apparent or emphasized. There are no notes or cautions on the installation drawing that would indicate design intent.

ANALYSIS OF OCCURRENCE:

This event is reportable under 10 CFR 50.73(a)(2)(vii) as an event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems or two independent trains or channels to become inoperable in a single system designed to shutdown the reactor and maintain it in a safe shutdown condition; remove residual heat; control the release of radioactive material; or mitigate the consequences of an accident. The solenoid- actuated pneumatic operators of the RCP Seal Injection Valves (MU66A-D) may not have been capable of closing the valves upon SFAS demand within the time required due to inadequate pressure setpoint for the valves' actuator pressure regulating valves. This is considered a common-mode failure. The four penetrations for the RCP Seal Injection lines are four independent systems. Each penetration is expected to operate independent of each other so that all four penetrations are isolated during an accident. A common mode

ANALYSIS OF OCCURRENCE (continued):

failure of all four AOVs results in all four independent systems being inoperable.

This condition is also reportable under 50.73(a)(2)(i)(B) as a condition prohibited by the plant's TS. TS 3.6.3.1 addresses the operability of containment isolation valves. The actuators on the RCP Seal Injection Isolation Valves have most likely been incapable of closing the valves since initial plant startup, rendering these valves inoperable for a period of time longer than permitted by TS without taking the actions specified.

The inadequate setpoint for the PRVs for MU66A-D is considered to be of low safety significance. Under postulated accident conditions for a small-break loss of coolant accident (LOCA), safety systems have been demonstrated to be fully capable of shutting down the reactor and maintaining it shutdown. The Seal Injection lines are very small in diameter (1-1/2 inch). In the worst case scenario, should one of the check valves inside containment fail coincident with a fail-to-close of the corresponding train MU66 valve, the resultant flow would be severely restricted and similar to a small-break LOCA. For analytical purposes, this represents an ISLOCA. Realistically, assuming the integrity of the Makeup System piping (designed to a pressure rating of 3050 psi downstream of the makeup pump) is maintained, reactor coolant water would be contained within a limited volume of the Makeup System piping located in the Auxiliary Building, thereby isolating the ISLOCA. Therefore, there would be no large or early release of radioactivity outside the containment.

The contribution to core damage frequency (CDF) from this potential ISLOCA was calculated to be a mean of 3.2E-8 per year. The public dose consequence of this accident sequence was calculated at 7.6E-2 Rem/year.

The test history of check valves MU242-245 has shown them to be highly reliable. These check valves are tested in accordance with the local leak rate testing program each refueling outage. Over the past 10 years, no test failure has occurred. Test results from the present refueling outage showed leakage to be well within allowable limits. Therefore, it is highly unlikely that failure of a check would have occurred under postulated accident conditions.

CORRECTIVE ACTIONS:

An AOV Reliability Program is being implemented, in part, to ensure that AOV sizing and setpoints are reviewed to verify and document their adequacy. For valves MU66A-D, MU38, and all other Category 1 and 2 AOVs and their associated components; 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.

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CORRECTIVE ACTIONS (continued):

The current design control process was reviewed and analyzed to determine if the process for component/system design modification would prevent a similar event from occurring. Based on a collective review of other issues related to the plant modification process and its implementation, a review of the entire design control process is being performed as part of the Davis-Besse Return to Service Plan. This review of the design control process will be completed, and associated changes to the process necessary to ensure the quality and technical adequacy of plant design changes, will be implemented prior to plant restart. These changes will include the incorporation of design interface review questions pertinent to AOVs into the design process. Interim compensatory actions have been established to verify the quality and technical adequacy of modifications currently being developed or that will be implemented prior to returning the systems to service.

Drawing 7749-M525-37-7 will be reviewed and revised to ensure that the actual configuration and the valve body arrow shown on the drawing are correct. This action is to be completed following the final design configuration determination based on the AOV Reliability Program requirements and prior to plant restart.

FAILURE DATA:

There have been no LERs in the previous two years at DBNPS involving improperly installed valves or improperly sized actuators that may result in the failure of the valve to move to its intended position upon receipt of an SFAS signal.

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

NP-33-02-004

CR 02-02254
CR 02-02408
CR 02-02494
CR 02-02994

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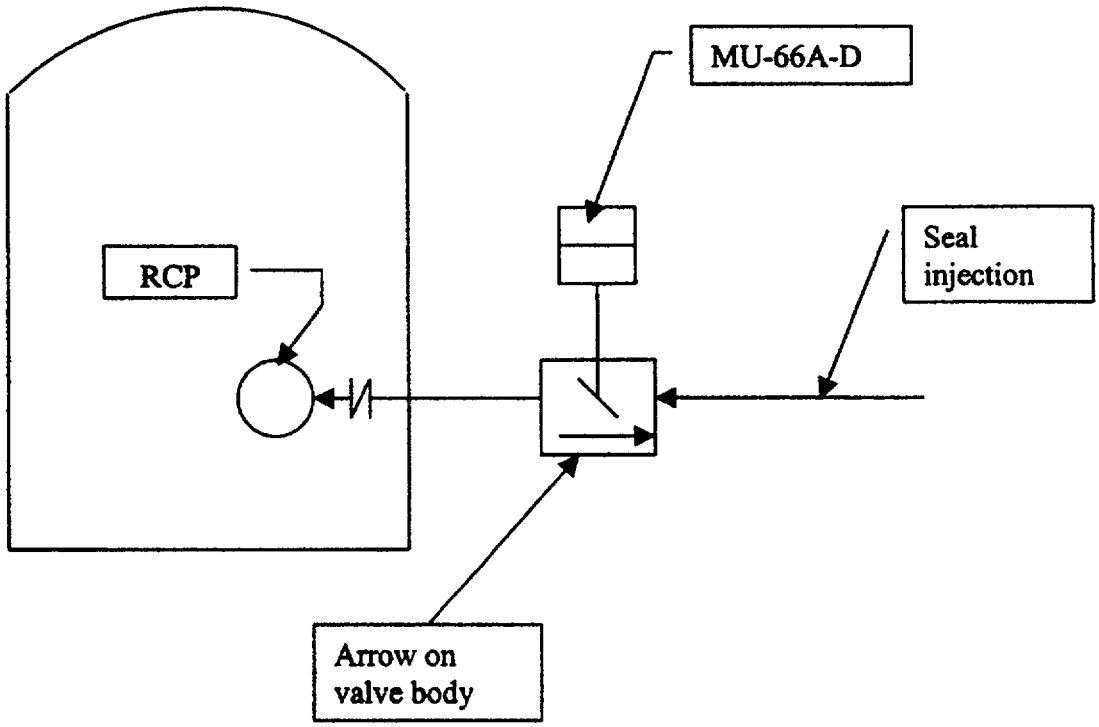
TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

Figure 1

MU66A-D As-Found Orientation



NOTE

Valve configuration reflects vendor drawing and the installed condition with the normal seal injection flow on top of disc. The design intent was to install the valve in reverse of this configuration with any RCS back-pressure on top of disc.