FirstEnergy

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

NP-33-02-001-00

Docket No. 50-346

License No. NPF-3

April 11, 2002

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

Ladies and Gentlemen:

LER 2002-001
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – February 14, 2002

Enclosed please find Licensee Event Report 2002-001, 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).

Very truly yours,

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

GMW/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
1.	Change the disk material for remaining 12 MSSVs to a pre-oxidized inconel X-750 material.	1. Completion due no later than the end of 15RFO.
2.	Continue to test all MSSVs every refueling outage unless otherwise specified. The increased frequency testing will continue until sufficient data is obtained to provide justification for less testing.	2. Ongoing
3.	Test the six MSSVs replaced during 13RFO at power	3. Within 90 days after return to full power operations
4.	Test one MSSV on each header that was not refurbished during 13RFO. If either valve lifts at >3% above setpoint, test remaining 10 MSSVs at that time.	4. Within 90 days after return to full power operations
5.	Change site procedures to require testing be performed utilizing the LVDT testing methodology for in-place or off-site testing	5. Prior to testing of MSSVs at power

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

LICENSEE EVENT REPORT (LER)

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

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

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

TITLE (4)

Main Steam Safety Valve Setpoints Greater Than Allowable Values

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
02	14	2002	2002	-- 001 --	00	04	11	2002		05000
									FACILITY NAME	DOCKET NUMBER 05000

		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)			
OPERATING MODE (9)	1	20.2201(b)	20.2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(vii)
POWER LEVEL (10)	095	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)
Gerald M. Wolf, Staff Engineer - Licensing	(419) 321-8114

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 February 14 and 15, 2002, with the unit in Mode 1 at approximately 95 percent power, setpoint testing determined four of the Main Steam Safety Valves (MSSVs) had a setpoint more than three percent above the desired setpoint. These setpoints exceeded the ASME Code allowable value, rendering the valves inoperable in accordance with the Technical Specifications. The setpoint of each MSSV was adjusted to within one percent of the desired setpoint upon discovery, as necessary. Based on the as-found lift setting pressures, the Main Steam System pressure would not have exceeded previously evaluated values during any anticipated overpressure transients. The three MSSVs with the highest initial setpoint appeared to have experienced oxide bonding between the stainless steel valve disk and nozzle seat. These three MSSVs were removed and replaced with valves that have inconel valve seats, which are less susceptible to oxide bonding. The valve disks of the remaining MSSVs will be replaced during the next two refueling outages with the inconel valve disks. The fourth MSSV that lifted high was due to inherent test methodology inaccuracies during previous tests. More accurate test equipment will be used in the future. This event is being reported in accordance with 10CFR50.73(a)(2)(i)(B) as a condition prohibited by the plant's Technical Specifications.

DESCRIPTION OF OCCURRENCE:

On February 14 and February 15, 2002, with the unit in Mode 1 at approximately 95 percent power, setpoint testing was conducted on the Main Steam Safety Valves (MSSVs) [SB-RV] in accordance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code. Nine MSSVs are installed on each of the two steam generator main steam headers; valves SP17B1 through 9 on Steam Generator 1 header, and valves SP17A1 through 9 on Steam Generator 2 header. Two MSSVs on each header have a setpoint of 1050 psig, and the remaining seven valves have a setpoint of 1100 psig. These 18 MSSVs prevent the secondary system pressure from exceeding 110 percent of its design pressure during the most severe anticipated system operational transient.

Technical Specification 3.7.1.1 states that all main steam line code safety valves shall be operable while in Modes 1, 2, and 3. No setpoint tolerance for the MSSVs is listed in the Technical Specifications beyond reference to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code requirements for inservice testing of ASME components. The current code of record (OMa-1996) for the Davis-Besse Nuclear Power Station (DBNPS) lists a three percent acceptance criterion for the MSSVs. Technical Specification 3.7.1.1 Action a allows continued power operations with MSSVs inoperable provided the High Flux Trip Setpoint is reduced based on the operable MSSV relieving capacity; there are a minimum of two operable MSSVs per Steam Generator, at least one with a setpoint not greater than 1050 psig (+/- 1%); and no operable MSSV has a setpoint greater than 1100 psig (+/- 1%).

All 18 MSSVs were designated for in-place testing. The following four MSSVs had setpoints that were outside the ASME Code acceptance criteria of +/- 3% of the set pressure:

Valve Number	Desired Setpoint (psig)	As Found Setpoint (psig)	Offset
SP17A4	1100	1154.8	+5.0%
SP17A9	1100	1179.4	+7.2%
SP17B3	1100	1153.9	+4.9%
SP17B4	1100	1136.8	+3.3%

These four valves had setpoints more than three percent above the desired setpoint, exceeding the ASME B&PV Code allowable value and rendering the valves inoperable in accordance with the Technical Specifications. The remaining fifteen MSSVs tested had as-found setpoints within the allowable +/- three percent of the desired setpoint.

Upon discovery of an individual valve's setpoint being outside of the allowable value, the valve was declared inoperable until the setpoint was adjusted to be within the allowable value. The High Flux Trip Setpoint had been reduced in accordance with Technical Specification 3.7.1.1 Action a for one MSSV to be inoperable prior to the start of testing.

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

DESCRIPTION OF OCCURRENCE: (Continued)

The existence of similar discrepancies in multiple valves is an indication that the discrepancies arose over a period of time. Therefore, it is assumed the plant operated with these four MSSVs inoperable without taking the actions specified in Technical Specification 3.7.1.1. In accordance with the guidance contained in NUREG-1022, Event Reporting Guidelines for 10 CFR 50.72 and 50.73, this condition represents operation of the plant in a condition that is prohibited by the plant's Technical Specifications. Therefore, this event is being reported as a Licensee Event Report in accordance with 10CFR50.73(a)(2)(i)(B).

APPARENT CAUSE OF OCCURRENCE:

The apparent cause of the three MSSVs exhibiting the highest relative setpoint (SP17A4, SP17A9 and SP17B3) to have a setpoint greater than the allowable setpoint is oxide bonding. Prior to the Thirteenth Refueling Outage, all MSSVs had Type 422 martenstic stainless steel disks and Type 316 austenitic stainless nozzles. The oxides of the nozzle and disk grow together due to the similar oxide structure of the two materials. The oxide bonding is initiated by performing refurbishment (i.e., lapping) of the disk and nozzle seats and/or by installing new disks of Type 422 martensitic stainless steel. Oxidation of the disks and nozzles occurs following installation of the MSSVs in a high-temperature steam environment. These MSSVs lifted high on the first test lift and then within tolerances on the second test lift, demonstrating sticking on the initial lift. This is consistent with the oxide bonding that has been experienced throughout the industry on the initial in-service lift following disk replacement and nozzle lapping. This oxide-bonding phenomenon is documented in Electric Power Research Institute (EPRI) publication TR-113560, Investigation of MSSV High First Lift Phenomenon in Dresser 3700 Series Steam Safety Valves.

The apparent cause of MSSV SP17B4 to have a setpoint greater than the allowable setpoint is test methodology inaccuracies during previous tests. This valve did not show signs of sticking and responded to adjustments in a predictable fashion. On-site testing conducted prior to 2002 was performed utilizing Hydroset test equipment. This equipment has inherent inaccuracies because it requires test personnel to determine when a safety valve begins to lift by audibly detecting steam flow through the valve, and to calculate the lifting force using the hydraulic pressure read from a pressure gauge in conjunction with measured steam pressure. Based on using this previous testing methodology, the valve setpoint was adjusted to a higher-than-desired value. Testing in 2002 utilized a Set Pressure Verification Device (SPVD). The SPVD utilizes a linear variable differential transformer (LVDT) to definitively measure when the valve lifts, and utilizes a load cell to measure the applied lifting force. Potential human error in determining when the valve lifted, reading and recording the pressure and calculating test results are eliminated by utilizing the SPVD.

ANALYSIS OF OCCURRENCE:

There were no systems or components inoperable at the beginning of this event that contributed to the severity of the event.

The MSSVs are designed to provide sufficient relieving capacity to assure the Main Steam System pressure remains below 1155 psig, or 110 percent of its design pressure of 1050 psig, during the most severe anticipated system operational transient as described in Section 5.2.2.3 of the Updated Safety Analysis Report (USAR) and Technical Specification Bases 3/4.7.1.1. The ASME B&PV Code (OMa-1996) establishes the as-found setpoint for safety valves at +/- three percent of the valve nameplate setpoint. Because of previous MSSV test failures, an analysis was performed to determine the effect of MSSV setpoint drift above the desired setpoint. This analysis concluded that overpressure protection is assured for each steam generator for each of the following conditions:

1050 psig setpoint MSSVs:	1100 psig setpoint MSSVs:
1 inoperable (does not lift)	1 inoperable (does not lift)
1 begins to open at +4% setpoint	6 begin to open at +3% setpoint

Four 1100 psig setpoint MSSVs, two on each header, had lift setting pressures that exceeded the ASME B&PV Code allowable value. Assuming the valves with the highest lift setting pressure on each header would not have lifted, the previous analysis bounds the as-found condition of the plant because the initial setpoints of the remaining MSSVs on each header would have provided the required overpressure protection for each Steam Generator.

CORRECTIVE ACTIONS:

Upon discovery of each MSSV with a setpoint higher than the ASME B&PV Code allowable value, the MSSV was declared inoperable and the setpoint of the valve was adjusted to be within the allowable value to support continued plant operation. The testing was performed with the High Flux Trip Setpoint reduced in accordance with Technical Specification 3.7.1.1 Action a for one MSSV inoperable prior to the start of MSSV testing.

The three MSSVs exhibiting the highest relative setpoint (SP17A4, SP17A9 and SP17B3) along with three other MSSVs (SP17A6, SP17B7, and SP17B6) were removed from the system and replaced with qualified spare MSSVs that had been previously rebuilt with pre-oxidized Inconel X-750 disks. The oxide layer that forms on the surface of the Inconel X-750 material has a lower tendency to interlock or adhere to the oxide of the nozzle material than the original stainless steel disks due to widely different chemical composition and crystalline structure of the two oxides. In accordance with EPRI publication TR-113560 and industry experience, the Inconel material should reduce the oxide-bonding phenomenon, and thus reduce the high initial lifts being observed for the MSSVs.

The disk material for the remaining 12 MSSVs will also be changed to Inconel X-750 during the next two refueling outages. This will be accomplished by installing Inconel disks during refurbishment of the spare MSSVs during the

CORRECTIVE ACTIONS: (Continued)

operating cycle, and then installing the spares during subsequent refueling outages. All 18 MSSVs will have Inconel disks installed no later than the end of the Fifteenth Refueling Outage, which is scheduled for Spring, 2006. A phased approach over the next two refueling outages is being used to ensure the apparent cause of the high initial in-service lifts is actually corrected by the installation of Inconel disks.

The six MSSVs replaced during the Thirteenth Refueling Outage will be tested at power no later than 90 days after return to full power operations. While the opportunity for oxide bonding is greatly reduced with the Inconel X-750 disk material, oxide bonding has been observed at other facilities. Testing the valves within 90 days after the plant is restarted will confirm whether oxide bonding is occurring with the new valve seats, and the valve test lifts will break any such bond that may occur.

According to EPRI publication TR-113560, once any oxide bonds are broken, the valve seat and nozzle do not tend to bond again as long as the oxide layers remain in-place, regardless of the valve materials. Therefore, the other 12 installed MSSVs should not be susceptible to oxide bonding as long as no refurbishment of the valve seating surfaces occurs. To verify that no oxide bonding is occurring, one MSSV on each header that was not refurbished during the Thirteenth Refueling Outage will be tested at power no later than 90 days after return to full power operations. If either of these two valves lift at more than three percent above the desired setpoint, the remaining 10 valves will also be tested at that time.

Site procedures will be changed to require that testing be performed in the most accurate manner utilizing the LVDT testing methodology for in-place or off-site testing. This should eliminate most of the setpoint variance experienced on valve SP17B4 due to inaccuracies in the testing methodology used prior to 2002. The procedures will be changed prior to testing the six MSSVs at power as specified above.

As previously described in DBNPS LER 2002-002, all MSSVs will continue to be tested every refueling outage unless otherwise specified. This testing interval will be maintained until sufficient data is obtained to provide justification for less testing.

FAILURE DATA:

DBNPS LERs 2000-002 and 1998-001 document previous occurrences where MSSV setpoints were outside of the Technical Specification allowable values.

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

NP-33-02-001-00 CR 2002-00502