FirstEnergy

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

NP-33-00-002-01

Docket No. 50-346

License No. NPF-3

May 24, 2001

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

Ladies and Gentlemen:

LER 2000-002
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence - March 29, 2000

Enclosed please find Revision 1 to Licensee Event Report (LER) 2000-002, which is being submitted to provide additional information regarding the subject occurrence. The changes are marked with a revision bar in the margin. Please destroy or mark superseded on previous copies of the LER. This LER is being submitted in accordance with 10CFR50.73(a)(2)(i)(B).

Very truly yours,

Howard W. Bergendahl
Plant Manager
Davis-Besse Nuclear Power Station

GMW/s

Enclosure

cc: Mr. J. E. Dyer, Regional Administrator, USNRC Region III
Mr. K. S. Zellers, 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 all 18 MSSVs to a pre-oxidized inconel X-750 material.	1. Completion due no later than the end of 16RFO.
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

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

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.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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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
03	29	2000	2000	-- 002 --	01	05	24	2001		05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100

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)	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)
Gerald M. Wolf, 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 March 27 and March 28, 2000, with the unit in Mode 1 at approximately 94 percent power, setpoint testing was conducted on the Main Steam Safety Valves (MSSVs). All 18 installed MSSVs were tested. Three of the tested MSSVs had a setpoint more than three percent above the desired setpoint, which 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. Six of the tested MSSVs, including the three that had a setpoint above the allowable value, were removed and replaced with valves less susceptible to sticking/ galling. The stainless steel valve seats of all 18 MSSVs will be replaced over the next four refueling outages with inconel valve seats to eliminate sticking/galling that is causing the high lift phenomenon. 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 March 27 and March 28, 2000, with the unit in Mode 1 at approximately 94 percent power, setpoint testing was conducted on the Main Steam Safety Valves (MSSVs) [SB-RV] in accordance with the requirements of Section XI 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 ASME B&PV Code requirements for inservice testing of ASME components. The code of record for the Davis-Besse Nuclear Power Station (DBNPS) lists a three percent acceptance criterion for the MSSVs (OM-1-1981). 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. On March 29, 2000, a Condition Report was initiated that documented the results of the MSSV testing. The following six MSSVs had setpoints that were above the Surveillance Test acceptance criteria of one percent:

Valve Number	Desired Setpoint (psig)	As Found Setpoint (psig)	Offset (%)
SP17A3	1100	1115	1.4
SP17A5	1100	1138	3.5
SP17A9	1100	1163	5.7
SP17B1	1100	1119	1.7
SP17B6	1050	1070	1.9
SP17B7	1050	1093	4.0

Three of these six valves, SP17A5, SP17A9, and SP17B7, 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 twelve MSSVs tested had setpoints not greater than one percent above the desired setpoint.

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 three MSSVs inoperable without taking the actions specified in Technical Specification 3.7.1.1. In accordance with the guidance contained

DESCRIPTION OF OCCURRENCE: (Continued)

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). Upon discovery of an individual valve's setpoint being outside of the ASME B&PV Code allowable value, the valve was declared inoperable until the setpoint was adjusted to be within the allowable value specified in Technical Specification 3.7.1.1. 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.

APPARENT CAUSE OF OCCURRENCE:

The most probable cause of the MSSVs to have a setpoint greater than the ASME B&PV Code allowable setpoint is seat and disc galling. The initial test lift of valve SP17B7, which has a 1050 psig setpoint, was at 1093 psig. The second test lift, performed to fulfill ASME Code requirements, was at 1062 psig without any adjustments performed from the initial test lift. This high initial lift phenomenon has been identified at other nuclear power plants with Dresser 3700 series safety valves. As a result, the Electric Power Research Institute (EPRI) initiated a project to investigate the cause of MSSVs sticking. Results of the EPRI project indicates the high lift phenomenon occurs somewhere within 30 to 90 days after installation of the safety valve and is a result of some form of sticking or galling of the seat and nozzle. The sticking or galling only occurs after maintenance is performed. Typically after one or two safety valve lifts the sticking/galling does not repeat. Evidence has shown that a gray finish on the disc to nozzle interface may reduce the potential for sticking/galling. Prior to this event, a mirror finish has been used on all DBNPS MSSVs to ensure leak tightness, and no valve lifts are performed once the MSSVs are reinstalled following maintenance. The gray finish is rougher than the mirror finish, and may help reduce galling between the seat and nozzle surfaces that occurs while the valve is inservice. A study performed by EPRI and Dresser Valve Company along with a group of utility representatives has concluded that changing the disk material from the originally-supplied 422 stainless steel to a pre-oxidized inconel X-750 material will eliminate the high lift phenomenon following valve maintenance.

When DBNPS LER 1998-001 was submitted, the cause of the MSSV that lifted at the highest pressure was attributed to the fact that the valve had been in storage for a period of time prior to installation. It was theorized that the extra pressure that exists between the valve seat and nozzle due to the lack of a force to counteract the spring force while a MSSV is in storage over a period of time caused the MSSV to stick when initially tested, possibly due to minor galling of the seat and nozzle surfaces. However, storage of an MSSV is no longer believed to be a contributor to a MSSV setpoint being above the ASME B&PV Code allowable value. Based on the results of the testing performed in March 2000, it is now believed this valve exhibited sticking/galling of the seat and

APPARENT CAUSE OF OCCURRENCE: (Continued)

nozzle as described above. This phenomenon was recognized at the time LER 1998-001 was written, but was not understood. The EPRI project to investigate the cause of MSSVs sticking was conducted after the submission of LER 1998-001.

ANALYSIS OF OCCURRENCE:

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 (OM-1-1981) establishes the as-found setpoint for safety valves at +/- three percent of the valve nameplate setpoint. Because of the previous MSSV test failures as documented in LER 1998-001, 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

Three MSSVs, one on one header (SP17B7) and two on the other header (SP17A5 and SP17A9) had a lift setting pressure that exceeded the ASME B&PV Code allowable value. Based on this analysis, assuming the valves with the highest lift setting pressure on each header would not lift, the as-found 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 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 four MSSVs exhibiting the highest relative setpoint (1100 psig setpoint valves SP17A5, SP17A9 and 1050 setpoint valves SP17B6 and SP17B7) were removed from the system for inspection. Two other MSSVs (1050 setpoint valve SP17A7 and 1100 psig setpoint valve SP17B3) that lifted five percent below the desired setpoint were also removed from the system for inspection. Six qualified spare MSSVs with a gray finish on the valve seats have been installed on the main steam line headers. The gray finish valve seats were installed as an interim measure in order to improve the performance of the valves by reducing the galling between the seat and nozzle surfaces that occurs while the valve is inservice.

CORRECTIVE ACTIONS: (Continued)

The disk material for the MSSVs will be changed from the originally supplied 422 stainless steel to a pre-oxidized inconel X-750 material. According to the study performed by EPRI, Dresser Valve Company, and a group of utility representatives, the inconel valve seats will eliminate the high lift phenomenon following valve maintenance. The DBNPS has 6 spare MSSVs, 2 with 1050 psig setpoints ('Q' orifice valves), and 4 with 1100 psig setpoints ('R' orifice valves). The six valves removed during the twelfth refueling outage will be refurbished and inconel disks installed. These valves will then be re-installed in the plant during the thirteenth refueling outage, which is scheduled for Spring, 2002. This cycle will be continued until all 18 MSSVs have inconel disks installed, which will be completed no later than the sixteenth refueling outage, which is scheduled for Spring, 2008.

Test equipment has been developed that detects the movement of the valve stem to determine the lift pressure more accurately. This test method has been evaluated and may be used in future testing.

The following are the corrective actions previously proposed in LER 1998-001 documenting the previous occurrence of the MSSVs to lift outside of the ASME B&PV allowable tolerance:

1. All MSSVs will be tested every refueling outage unless otherwise specified until sufficient data is obtained to provide justification for less testing.
2. Each MSSV will be tested prior to installation if the MSSV has been in storage for greater than two years.
3. One of the MSSVs rebuilt during 11RFO will be tested prior to the end of the thirteenth refueling outage.
4. A setpoint check will be performed on a sample of the MSSVs that are refurbished and reinstalled during 12RFO.
5. The progress of the EPRI project to investigate and correct the cause of MSSVs sticking will be followed and the project's proposed actions will be incorporated as appropriate.

Action 1 will continue to be performed as originally proposed. Actions 2 and 3 were proposed to help identify and correct the effects of storage on the setpoint of a MSSV. Based on the results of the EPRI project, storage of a MSSV is no longer believed to be a cause of a MSSV setpoint being above the ASME B&PV Code allowable value, so these actions will no longer be performed. The installation of inconel valve disks eliminates the need for Action 4, so this action will also no longer be performed. EPRI has issued the report "Investigation of MSSV High First Lift Phenomenon in Dresser 3700 Series Steam Safety Valves," that recommends replacing valve disks with inconel material and satisfies the intent of Action 5.

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

FAILURE DATA:

DBNPS LER 1998-001 documents a previous occurrence where MSSV setpoints were outside of the Technical Specification allowable values. It should be noted that LER 1998-001 reported MSSVs that lifted more than one percent below the Technical Specification allowable value as being inoperable as well as reporting the MSSVs that lifted more than one percent above the allowable value. The DBNPS Technical Specifications only require the MSSVs to be operable in accordance with the ASME B&PV Code, and the ASME B&PV Code specified the MSSVs shall have a setpoint not more than three percent above the specified value, so the MSSVs that lift at less than three percent above the specified value need not be declared inoperable.

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

NP-33-00-002-01 CR 2000-0662