



A Center Energy Company

EDISON PLAZA
300 MADISON AVENUE
TOLEDO, OHIO 43652-0001

AB-92-015
NP-33-91-007, Rev. 1

Docket No. 50-346

License No. NPF-3

March 30, 1992

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

Gentlemen:

LER 91-007, Revision 1
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence - December 6, 1991

Enclosed please find Revision 1 to Licensee Event Report 91-007. The changes are marked with a revision bar in the margin. Please destroy or mark superseded any previous copies of this LER.

Very truly yours,

A handwritten signature in cursive script that reads 'Louis F. Storz'.

Louis F. Storz
Plant Manager
Davis-Besse Nuclear Power Station

LFS/ed

Enclosure

cc: Mr. A. Bert Davis
Regional Administrator
USNRC Region III

Mr. William Levis
DB-1 NRC Sr. Resident Inspector

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Handwritten initials in the bottom right corner, possibly 'JL' or similar, with a vertical line next to them.

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20565, AND TO THE PAPERWORK REDUCTION PROJECT (2150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

FACILITY NAME (1): Davis-Besse Unit No. 1 DOCKET NUMBER (2): 0 5 0 0 0 3 4 6 PAGE (3): 1 OF 0 5

TITLE (4): Shutdown Required by Technical Specifications due to Emergency Diesel Generator Problems

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 NAMES														
1	2	0	6	9	1	9	1	0	0	7	0	1	0	3	3	0	9	2	0	5	0	0	0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 1 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11):

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(i)(v)	<input type="checkbox"/> 72.71(b)
<input type="checkbox"/> 20.406(a)(1)(iii)	<input type="checkbox"/> 50.38(a)(1)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 72.71(c)
<input type="checkbox"/> 20.406(a)(1)(iv)	<input type="checkbox"/> 50.38(a)(2)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/> 20.406(a)(1)(v)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(vi)(A)	
<input type="checkbox"/> 20.406(a)(1)(vi)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(vi)(B)	
<input type="checkbox"/> 20.406(a)(1)(vii)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12):

NAME: N. K. Peterson, Engineer - Nuclear Licensing TELEPHONE NUMBER: 4 1 1 9 3 1 2 1 1 - 1 8 1 4 1 5 1 0

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

CAUSE	SYSTEM	COMPONENT	MANUFAC TURE	REPORTABLE TO NRRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC TURE	REPORTABLE TO NRRDS
X	EIK	ISIC10	S15119	Y					

SUPPLEMENTAL REPORT EXPECTED (14): YES (if yes, complete EXPECTED SUBMISSION DATE:) NO

EXPECTED SUBMISSION DATE (15): MONTH: DAY: YEAR:

ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single space typewritten lines) (16):

On December 3, 1991, at 0500 hours, Emergency Diesel Generator (EDG) 1-2 was taken out of service for routine maintenance. Post maintenance testing was unsuccessful. The symptoms of the failure indicated a defective speed switch. The 72 hour action statement of TS 3.8.1.1(a) expired on December 6, 1991, at 0500 hours and a plant shutdown was commenced. Hot Standby (Mode 3) was reached at 1054 hours on December 6, 1991. Toledo Edison's request for a temporary waiver of compliance to allow the plant to remain in Hot Standby for up to seven days while performing troubleshooting was granted on December 6, 1991.

Troubleshooting identified a defective speed switch. Upon replacement of the speed switch, EDG 1-2 was successfully tested and restored to operable status at 0205 hours on December 11, 1991. The plant commenced startup and MODE 1 was achieved at 1117 hours on December 11, 1991.

The initiation of the plant shutdown required by TS was reported to the NRC via Emergency Notification System (ENS) at 0834 hours on December 6, 1991 under 10 CFR 50.72 (b)(1)(i)(A).

The completion of a plant shutdown required by TS is being reported as an LER under 10 CFR 50.73(a)(2)(i)(A).

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545 AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Davis-Besse Unit No. 1	DOCKET NUMBER (2) 0 5 1 0 0 0 3 4 6 9 1	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 1	0 0 7	0 1	0 2	OF 0 5

TEXT (if more space is required, use additional NRC Form 306A-2/117)

Description of Occurrence:

On December 3, 1991, at 0500 hours, Emergency Diesel Generator (EDG-EK) 1-2 was taken out of service for routine maintenance. However, post maintenance testing was not successful when the air start motors did not retract. The problem was determined to be a failed speed switch. Due to the similarities between the symptoms of this failure and the symptoms of a previous failure in November, an intensive troubleshooting campaign was conducted. Based on the results, the speed switch was replaced. The EDG 1-2 was successfully idle started on December 4 and successfully fast started on December 5, 1991. The EDG 1-2 was declared operable at 1427 hours on December 5, 1991.

At 2340 hours on December 5, 1991, the control room operators began receiving alarms indicating trouble with EDG 1-2, including a diesel generator lockout. EDG 1-2 was declared inoperable by the Shift Supervisor, and the action statement of Technical Specification (TS) 3.8.1.1 was entered. Based on preliminary indications of another failed speed switch, Toledo Edison made a conservative decision that the 72 hour allowed outage time entered at 0500 on December 3, 1991 was again applicable. Since the problem could not be resolved within the 72 hours action statement, a plant shutdown was initiated. At 1054 hours on December 6, 1991, the plant entered Mode 3 (Hot Standby) in compliance with TS 3.8.1.1.

Toledo Edison requested and was granted a temporary waiver of compliance from the TS requirement to go to Mode 5 (Cold Shutdown) within the following 30 hours. This allowed the plant to remain in Mode 3 for up to seven days. Verbal approval was received at 1700 hours on December 6, 1991.

The initiation of a plant shutdown required by TS was reported to the NRC via the ENS at 0834 hours on December 6, 1991 in accordance with 10 CFR 50.72(b)(1)(i)(A).

The completion of a plant shutdown required by TS is being reported as an LER in accordance with 10 CFR 50.73(a)(2)(i)(A).

Apparent Cause of Occurrence:

The failed speed switch from December 3, 1991 was found to have a cold solder joint. It was subsequently repaired onsite, tested, and used to replace the damaged switch from the December 5 failure.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST, 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P&30) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Davis-Besse Unit No. 1	DOCKET NUMBER (2) 0 5 0 0 0 3 4 6 9 1	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
			0 0 7	0 1	0 3	OF 0 5

TEXT (if more space is required, use additional NRC Form 366A's) (17)

Apparent Cause of Occurrence (Continued):

The problem noted at 2340 hours on December 5, 1991, appeared to be caused by the speed switch. A troubleshooting action plan was developed and approved by Toledo Edison management. Extensive non-intrusive testing isolated the problem to a speed switch circuit that provides EDG 1-2 control functions. External electrical systems were checked for potential influence on the speed switch. All inputs and outputs to and from the installed speed switch circuit were monitored. Data collected indicated that there was a ground in the speed switch circuit. To locate it, leads connected to the speed switch were lifted and components were isolated individually (with the failed speed switch still installed). The speed switch was then removed and bench tested onsite. The data gathered from the bench test was found to be similar to the data gathered when the speed switch was previously tested in its installed location. The speed switch was identified to be the source of the ground. The switch is a model ESSB-4AT from the Synchro Start Products Corporation. The switch was specified and qualified by MKW Power Systems, Inc.

The speed switch cover was removed for visual inspection of the internals. The preliminary visual inspection showed a damaged capacitor and thermally damaged components on the voltage regulator card. The speed switch internals were thermally damaged only on the voltage regulating board. The actual failure mechanism could not be determined with certainty by visual inspection and onsite testing capabilities.

The speed switch was sent to a test laboratory (independent of the vendor) for analysis. The root cause of the switch failure was determined to be a short-circuited transistor base-to-collector pin connection on the speed switch's main power supply board. This allowed excessive current to be drawn through the transistor causing overheating of other power supply components and subsequent power supply failure.

The results of the failure analysis were provided to the vendor (MKW Power Systems, Inc.) for review. The vendor determined that this failure and the December 3, 1991 failure were isolated and unrelated random events. The vendor also informed TE that no similar speed switch failures in nuclear service applications have been reported.

Analysis of Occurrence:

The safety function of the EDG is to provide highly reliable, independent sources of power to the various components necessary for the Engineered Safety Features (ESF) systems to function as assumed in the Safety Analysis Report (SAR). The EDGs are only required to function if the station's main generator trips and the offsite power supply to an essential bus fails. Bus load shedding and isolation, bus transfer to the EDG, and pickup of critical loads is automatic.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Davis-Besse Unit No. 1	DOCKET NUMBER (2) 0 5 0 0 0 3 4 6 9 1	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
			0 0 7	0 1	0 4	OF 0 5

TEXT IF MORE SPACE IS REQUIRED, use additional NRC Form 385A (17)

Analysis of Occurrence (Continued):

During the period that the EDG 1-2 was unavailable, all the other normal power supplies were available. The EDG 1-1 (which contains the identical control circuit design) was tested to verify it was functioning properly and was operable. Consequently, without the EDG 1-2 available to energize an essential bus, sufficient flexibility and control existed within the electrical distribution system for plant operators to align one of the other power sources to the affected bus.

The following compensatory actions were taken while EDG 1-2 was unavailable:

- a) Other than required Technical Specification surveillance test requirements, additional testing or preventive maintenance activities were not performed on the EDG 1-1 or on Train 1 equipment.
- b) Electrical distribution equipment, either normal, standby or reserve, was not taken out of service. In addition, hourly inspections of the 345kv switchyard were performed.
- c) The load dispatcher was notified daily not to take out of service any incoming transmission lines to the DBNPS, except for emergency requirements.
- d) To preclude unnecessary challenges being made to safety systems, other safety related equipment was not taken out of service.
- e) The National Weather Service forecasts were monitored by the DBNPS meteorologist and the shift supervisor updated periodically of the weather conditions. The forecast did not include any severe weather conditions. Temperatures were expected to be slightly above normal with lows in the range of 30-40 degrees Fahrenheit. If ice storms or other severe weather conditions had been observed, plant management was to have been notified to determine appropriate actions.
- f) Planned work activities were prestaged to the extent practical and performed under an approved action plan.
- g) CC1471, CCW supply to EDG 1-1 Jacket Water Heat Exchanger, was left in the open position until EDG 1-2 was declared operable. This valve automatically opens when the EDG speed reaches 40 RPM to provide cooling water flow to the EDG jacket water heat exchanger.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630) U.S. NUCLEAR REGULATORY COMMISSION WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104) OFFICE OF MANAGEMENT AND BUDGET WASHINGTON, DC 20503

FACILITY NAME (1) Davis-Besse Unit No. 1	DOCKET NUMBER (2) 0 5 0 0 0 3 4 6 9 1 - 0 0 1 7 - 0 1 0 4 OF 0 5	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		

TEXT (If more space is required, use additional NRC Form 366A's) (17)

Analysis of Occurrence (Continued):

- h) EDG 1-1 was re-tested in accordance with SI 4.8.1.1.2.a.4, within 24 hours of entry into Mode 3, and at least every 72 hours thereafter until EDG 1-2 was restored to operable status. Should EDG 1-1 have become inoperable, the plant would have been placed in cold shutdown within the following 30 hours.
- i) Operating personnel were notified by Standing Order to ensure these actions were maintained.

Corrective Actions:

The failed speed switch was replaced under Maintenance Work Order (MWO) 1-91-1723-00. The EDG Monthly Test, DB-SC-03071, was successfully performed, and EDG 1-2 was declared operable at 0205 hours on December 11, 1991.

Guidance that could be used to operate EDG 1-2 in an emergency situation without a speed switch installed or with a defective speed switch was developed as a compensatory measure.

A test program was developed to confirm the reliability of EDG 1-2. The test program was developed in accordance with Nuclear Management and Resources Council (NUMARC) diesel generator reliability guidelines. The program performed the monthly surveillance test procedure seven times from December 10, 1991 through January 13, 1992. No abnormalities were noted during the testing.

The failed speed switch was analyzed by an independent test laboratory. Based upon the results of the analysis described earlier and consultation with the vendor, TE determined this failure is not reportable under 10CFR21.

In addition, TE has notified the industry of this event through the INPO Nuclear Network.

Failure Data:

This is the first LER involving an EDG equipment failure since the 10 CFR 50.73 rule change in 1984.

NP 33-91-07

PCAQR 91-0609 and 91-0603