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NP-33-05-001-00

Docket Number 50-346

License Number NPF-3

March 14, 2005

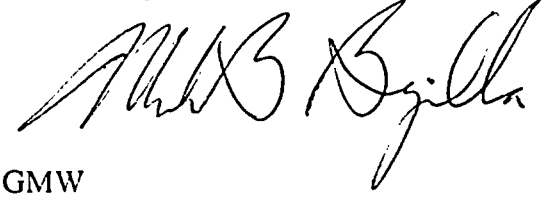
United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Ladies and Gentlemen:

LER 2005-001-00
Davis-Besse Nuclear Power Station, Unit Number 1
Date of Occurrence – January 13, 2005

Enclosed please find Licensee Event Report 2005-001-00, which is being submitted to provide written notification of de-energization of an Essential 4160 Volt Bus and start of an Emergency Diesel Generator during surveillance testing of undervoltage relays. This event occurred due to inadvertent contact of a test lead with an energized portion of the undervoltage relay circuitry. This event is being reported pursuant to 10CFR50.73(a)(2)(iv)(A) as an event that resulted in automatic actuation of an Emergency Diesel Generator. Immediate notification of this event was made to the Nuclear Regulatory Commission on January 13, 2005 (Event Number 41330). Commitments associated with this Licensee Event Report are listed in the Attachment.

Very truly yours,



GMW

Attachment
Enclosure

cc: Regional Administrator, USNRC Region III
DB-1 Senior Project Manager, USNRC
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 Compliance (419-321-8585) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
1. The station administrative procedure governing the conduct of maintenance will be revised to direct that test leads and jumpers that could affect a critical system function or have a significant plant impact should be protected from inadvertent contact by a combination of shielded plugs and/or two-part test leads/jumpers and/or insulated material. In applications where these types of test leads and jumpers cannot be used, the procedure will direct that a Condition Report be generated to determine appropriate compensatory measures or evaluation of acceptable risk.	1. April 30, 2005
2. Panel mounted shielded connections will be designed and installed to eliminate the potential for inadvertent contact for the test connections on the Essential Buses C1 and D1.	2. Test connections will be installed during the next scheduled Essential Bus outages, which are currently scheduled for the 14th Refueling Outage (Spring 2006) for Bus D1, and the 15th Refueling Outage (Spring 2008) for Bus C1.

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 6/30/2007

Estimated burden per response to comply with this mandatory 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 and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@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 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Davis-Besse Unit Number 1	05000346	1 OF 6

4. TITLE

Inadvertent Loss of Essential Bus and Start of Emergency Diesel Generator During Testing

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	13	2005	2005	- 001 -	00	03	14	2005		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

100

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

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

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Gerald M. Wolf, Staff Engineer, Regulatory Compliance	(419) 321-8001

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

☐ YES *(If yes, complete EXPECTED SUBMISSION DATE).* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On January 13, 2005, at 0849 hours with the plant at approximately 100 percent power, surveillance testing was in progress on the 4160 Volt Essential Bus D1 undervoltage relays. While moving a test lead towards a test lug, the technician inadvertently touched the test lead to an open energized knife switch in close proximity, shorting the potential transformer circuit, clearing the circuit's fuse and actuating the undervoltage relays. Emergency Diesel Generator (EDG) 2 started automatically due to actuation of the undervoltage relays, but was subsequently manually shutdown by plant operators when it was noted that it was operating without its ultimate source of cooling water. The shutdown of the EDG resulted in de-energization of Essential Bus D1. Due to the loss of power to the train 2 station battery chargers, a plant shutdown was initiated at 0949 hours in accordance with Technical Specification 3.0.3. The cleared fuse was replaced, the affected equipment re-energized, and the plant shutdown terminated at 1051 hours. Corrective actions include requiring use of shielded test plugs and/or two-part test leads/jumpers during testing of equipment that could affect a critical system function or have a significant plant impact. This event is being reported in accordance with the 10CFR50.73(a)(2)(iv)(A) as an event that resulted in automatic actuation of an Emergency Diesel Generator.

LICENSEE EVENT REPORT (LER)

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Davis-Besse Unit Number 1	05000346	2005	-- 001 --	00	2 OF 6

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

DESCRIPTION OF OCCURRENCE:

On January 13, 2005, with the Davis-Besse Nuclear Power Station (DBNPS) in Mode 1 operating at approximately 100 percent power, surveillance testing was in progress utilizing procedure DB-ME-03046, "D1 Bus Under Voltage Units Monthly Functional Test" (Revision 06 dated May 5, 2004). This procedure performs a monthly functional check of the Safety Features Actuation System (SFAS) [JE] undervoltage units for Essential 4160 Volt Bus D1 [EB] in accordance with Technical Specification Surveillance Requirements 4.3.2.1.1, Table 4.3-2. This procedure functionally checks the Essential Bus Feeder Breaker Trip at 90 percent voltage and the Emergency Diesel Generator [EK-DG] Start and Load Shed at 59 percent voltage.

Power to the two 4160 Volt Essential Buses C1 and D1 is normally supplied from the 4160 V non-essential Buses C2 and D2 [EA], respectively. The non-essential buses are normally powered from either the Unit Auxiliary Transformer [EL-XFMR] (when the Turbine-Generator is on-line) or from one of two Startup Transformers [FK-XFMR]. Bus tie transformers [EA-XFMR] step down the voltage from 13.8 kV to supply power to the non-essential 4160 V buses (all voltages listed are nominal voltage).

Two redundant Emergency Diesel Generators (EDGs) provide onsite standby sources to supply their respective 4160 Volt Essential Buses. If essential bus voltage is not maintained, the undervoltage relays [EB-27] set at approximately 90 percent of nominal bus voltage automatically initiate isolation of the essential bus following a brief time delay of several seconds. The loss of voltage relays set at approximately 59 percent of nominal bus voltage automatically initiate load shedding and EDG starting after a very short time delay. If an actuation of the SFAS occurs in conjunction with the loss of voltage, the sequencer will automatically load the bus.

During the undervoltage functional test being performed on January 13, 2005, the individual performing the test was inserting a test lead as directed by the procedure terminated with an unshielded male banana plug into an open barrel of a test lug. The opposite end of the test lead was properly connected to a grounded test equipment jack. Due to the location of the equipment (approximately six inches above floor level), the individual was working in a crouched/kneeling position and reaching into a tight space near the floor. To identify the proper test lug, he pointed to the lug with his left hand and received a peer check that the lug was the proper one. At approximately 0849 hours, while moving the test lead towards the test lug, the individual inadvertently touched the test lead to an open, energized knife switch that was in close proximity. When the test lead contacted the protruding blade of the knife switch, the energized D1 bus monitoring circuit was shorted to ground, causing the circuit's fuse to clear (blow) due to high current. The blown fuse caused a loss of voltage input to the 59% loss of voltage relays for Essential Bus D1, which then actuated to trip the feeder breakers supplying the bus and fast-started EDG 2.

Following the start of EDG 2 and the closing of its output breaker to reenergize Essential Bus D1, operators noted that Bus D1 voltage was reading low, Component Cooling Water Pump 2 Motor [CC-MO] current was indicating lower than expected, and Service Water Pump 2 [BI-P] did not start. Because EDG 2 was operating without its ultimate source of cooling water along with the indications that Bus D1 voltage was approximately 1500 Volts, an emergency shutdown of EDG 2 was performed. The shutdown of EDG 2 resulted in de-energization of Essential Bus D1.

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

DESCRIPTION OF OCCURRENCE (continued):

The de-energization of Essential Bus D1 resulted in the following Technical Specification (TS) equipment being rendered inoperable because neither normal or emergency power was available:

- Makeup Pump 2 (TS 3.1.2.4)
- Steam and Feedwater Rupture Control System Channel 4 (TS 3.3.2.2)
- Emergency Core Cooling Subsystem Train 2, including High Pressure Injection Pump 2 and Decay Heat/Low Pressure Injection Pump 2 (TS 3.5.2)
- Containment Spray Pump 2 (TS 3.6.2.1)
- Containment Air Cooler 2 (TS 3.6.2.2)
- Containment Isolation Motor-Operated Valves (TS 3.6.3.1)
- Containment Hydrogen Analyzer Channel 2 (TS 3.6.4.1)
- Hydrogen Dilution Blower 2 (TS 3.6.4.3)
- Emergency Ventilation System Train 2 (TS 3.6.5.1)
- Auxiliary Feedwater Train 2 (TS 3.7.1.2)
- Component Cooling Water Loop 2 (TS 3.7.3.1)
- Service Water Loop 2 (TS 3.7.4.1)
- Control Room Emergency Ventilation System Train 2 (TS 3.7.6.1)
- Emergency Diesel Generator 2 (TS 3.8.1.1)
- 4160 V Essential Bus D1 (TS 3.8.2.1)
- DC Bus Train 2 (TS 3.8.2.3).

The de-energization of Essential Bus D1 caused the de-energization of 480 V Bus F1 [EC-BU] that, in turn, resulted in a loss of power to Station Batteries 2N and 2P battery chargers [EJ-BYC]. While DC loads remained energized from the Station Batteries 2N and 2P [EJ-BTRY], the loss of power to both battery chargers resulted in the plant being outside the Limiting Condition for Operation of TS 3.8.2.3, therefore TS 3.0.3 was entered at 0849 hours, which required initiation of a plant shutdown within 1 hour of occurrence. At 0949 hours, a plant shutdown was initiated as required by Technical Specification 3.0.3.

A problem solving and decision making team was formed to investigate the event. The investigation discovered the blown secondary side Potential Transformer (PT) fuse. The fuse was replaced and Essential Bus D1 was reenergized at 1049 hours. With power restored to the Station Battery Chargers, TS 3.0.3 was exited at 1051 hours, and the plant shutdown was terminated at approximately 96 percent power. Service Water Pump 2 was then restarted.

With the restoration of power to the battery chargers, Station Batteries 2N and 2P were placed on equalizing charge at 1208 hours. After approximately an hour on equalizing charge, Batteries 2N and 2P were placed on a float charge and verified that the charging current was less than 2 amperes. The batteries were then declared operable and TS 3.8.2.3 was exited at 1345 hours.

Follow-on review of this event determined that TS 3.0.3 should not have been exited when power was restored to the Station Battery Chargers at 1051 hours. At this time Batteries 2N and 2P had a less than full charge, and therefore the requirements of TS 3.8.2.3 Action b, which requires no more than one battery to be inoperable, were still not met. However, had the plant remained in TS 3.0.3, the next required action was for the plant to be in Mode 3 within six hours of initiating the plant shutdown, or at 1549 hours. Because Station Batteries 2N and 2P were returned to Operable status at 1345 hours, TS 3.0.3 would have been exited prior to the plant being required to be in Mode 3 (1549 hours), therefore no violation of TS 3.0.3 occurred.

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DESCRIPTION OF OCCURRENCE (continued):

Initial notification of this initiation of a plant shutdown required by the Technical Specifications was made to the NRC at 1332 hours on January 13, 2005, in accordance with the four-hour reporting requirement of 10CFR50.72(b)(2)(i) (Event Number 41330). Notification of the valid actuation of an Emergency Diesel Generator was also made at this time in accordance with the eight-hour reporting requirement of 10CFR50.72(b)(3)(iv)(A). This report is being submitted in accordance with the 10CFR50.73(a)(2)(iv)(A) as an event that resulted in automatic actuation of an Emergency Diesel Generator.

APPARENT CAUSE OF OCCURRENCE:

The cause of Essential Bus D1 de-energizing was the clearing of a potential transformer fuse when the test lead contacted the potential transformer circuit, grounding the circuit. Clearing the potential transformer fuse caused the Essential Bus D1 undervoltage relays to actuate, causing the opening of the Essential Bus D1 Supply Breaker, de-powering the Bus, and starting EDG 2.

The plant was relying on a single human action (being careful) to prevent the event from occurring. Changes had not been made to remove the potential for de-powering the Essential 4160 V Buses by grounding the potential transformers during testing. Improvements in test leads were made in the past by recommending the use of test plugs and jacks instead of using test leads with alligator-style clip or mini-grabber connectors. However, due to the unavailability of shielded test plugs that would connect with the installed jacks on Essential Buses C1 and D1, shielded test plugs were not being used for routine tests.

In addition, when a trip of the Fuel Handling Ventilation System [VG] occurred in 2001 due to the use of inadequate test leads (i.e., use of alligator-style clips), the resultant recommendation was to use only shielded connectors during activities where systems needed to be maintained for nuclear or personnel safety. However, this recommendation was not fully implemented for Essential Buses C1 and D1 because the shielded type of connectors could not be acceptably configured.

ANALYSIS OF OCCURRENCE:

There were no safety concerns identified during or as a result of this event. In accordance with the DBNPS policy of allowing work activities on only one train of safety equipment, equipment designated as train 1 was not affected from the de-energization of Essential Bus D1. All off-site to on-site power sources remained energized during this event. With the exception of Service Water Pump 2, all train 2 equipment responded appropriately to the de-energization of Essential Bus D1.

The failure of Service Water Pump 2 to start was a direct result of the event, in that the undervoltage relays were still tripped due to the cleared fuse when the pump received a signal to automatically start. Following replacement of the cleared fuse, the Service Water Pump was started successfully.

A review of the associated circuits showed that the clearing of the potential transformer fuse would cause abnormal voltage readings for Essential Bus D1.

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ANALYSIS OF OCCURRENCE (continued):

Investigation into the lower than expected current readings of Component Cooling Water Pump 2 Motor determined these to be the result of the motor ammeter sticking at the lower end of the indicating band. No problems were encountered with the operation of the pump after power was restored to Essential Bus D1, and a notification to repair or replace this ammeter was generated. Because Component Cooling Water Pump 2 started and was operating after EDG 2 started, it provided cooling to EDG 2 during the approximately five minutes EDG 2 operated. Therefore, even though EDG 2 was shutdown because Service Water Pump 2 did not start to provide cooling water to the Component Cooling Water System that in turn would provide cooling water to EDG 2, based on a review of plant computer data no EDG operating temperature limits were exceeded. Performance of the EDG 2 Monthly Test later in the day on January 13, 2005 showed no problems with EDG 2.

Based upon the proper response of the affected equipment to the de-energization of Essential Bus D1, the short duration of time that train 2 equipment was unavailable until the cleared fuse was replaced, and the availability of train 1 equipment to respond to any actual event during this time frame, the de-energization of Essential Bus D1 had minimal safety significance.

CORRECTIVE ACTIONS:

The cleared Essential Bus D1 potential transformer fuse was replaced and Essential Bus D1 was re-energized at 1049 hours. Equipment affected by the de-energization of Bus D1 was returned to service in accordance with plant procedures and Technical Specification requirements.

The station administrative procedure governing the conduct of maintenance will be revised to direct that test leads and jumpers that could affect a critical system function or have a significant plant impact should be protected from inadvertent contact by a combination of shielded plugs and/or two-part test leads/jumpers and/or insulated material. In applications where these types of test leads and jumpers cannot be used, the procedure will direct that a Condition Report be generated to determine appropriate compensatory measures or evaluation of acceptable risk. This action will eliminate the potential for inadvertent contact while establishing standards for the types of test leads and jumpers allowed to be used during testing activities.

Since the application of shielded plugs has not been successful for the test connection used during undervoltage relay testing, panel mounted shielded connections will be designed and installed to eliminate the potential for inadvertent contact for the test connections on the Essential Buses C1 and D1. These connections will be installed during the next scheduled Essential Bus outages.

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FAILURE DATA:

There have been no Licensee Event Reports at the DBNPS involving a de-energization of an Essential 4160 V Bus in the previous three years that were not the result of external causes (LER 2003-009 documented a loss of offsite power at the DBNPS due to degraded regional grid voltage where both EDGs started to re-energize the Essential 4160 V Buses). Three similar events occurred at the DBNPS involving de-energization of Essential 4160 V Buses during undervoltage relay testing in 1988, 1989, and 1990. Following these three events, plant equipment was modified to add a test block to allow better access to connection points and better connection points for undervoltage relay testing. However, these previously modified connections were not the connections involved in the January 13, 2005, test of the undervoltage relays.

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

NP-33-05-001-00

CRs 2005-00219,
2005-00260