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October 15, 2010
L-10-273

10 CFR 50.73

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

SUBJECT:
Davis-Besse Nuclear Power Station
Docket Number 50-346, License Number NPF-3
Licensee Event Report 2010-003

Enclosed is Licensee Event Report (LER) 2010-003, "Auxiliary Feedwater Control Valve Inoperable Due to Inadequate Prioritization of DC System Ground." This LER is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B), operation in a condition prohibited by the Technical Specifications.

There are no regulatory commitments contained in this letter or its enclosure. The actions described represent intended or planned actions and are described for information only. If there are any questions or if additional information is required, please contact Mr. Patrick J. McCloskey, Manager, Site Regulatory Compliance, at (419) 321-7274.

Sincerely,

KW Byrd for B. Allen

Barry S. Allen

GMW

Enclosure: LER 2010-003-00

cc: NRC Region III Administrator
NRC Resident Inspector
NRR Project Manager
Utility Radiological Safety Board

IE22
NRR

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 8/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 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)

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4. TITLE

Auxiliary Feedwater Control Valve Inoperable Due to Inadequate Prioritization of DC System Ground

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
07	02	2010	2010	- 003 -	00	10	15	2010		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)	☐ 20.2203(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)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	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, Supervisor, Nuclear 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
B	BA	FSV	T020	Y					

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 July 17, 2010, with the Davis-Besse Nuclear Power Station in Mode 1 at approximately 100 percent power, the discharge control solenoid valve (FV6451) for Auxiliary Feedwater (AFW) Train 2 was found de-energized during surveillance testing. Evaluations completed August 16, 2010, determined the valve had been potentially de-energized and inoperable for 18 days due to a DC motor control center (MCC) ground resulting from a main transformer oil pump flow indicating switch stuck in the closed position. The ground fault induced a voltage greater than the design capacity of the position controller board for the valve.

The root cause of this event was determined to be a lack of program implementation by site organizations for finding DC system grounds, resulting in a mindset to inadequately prioritize ground indications. An unacceptable ground had been identified on DC MCC 2 on April 7, 2010, and it degraded into a hard ground on July 2, 2010, resulting in the failed AFW discharge valve (FV6451). This issue is being reported per 10CFR50.73(a)(2)(i)(B) as an operation prohibited by Technical Specifications. One AFW train was affected, therefore, no loss of safety function occurred. Corrective Actions include clarifying program ownership, procedure improvements used to locate DC system grounds, and training on conservative assumptions and prioritization of DC system ground indications.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

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NARRATIVE

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

System Description:

The DBNPS Direct Current (DC) electrical power system [DC] provides the Alternating Current (AC) emergency power system [EK] with control power. It also provides both motive and control power to selected safety related equipment and preferred AC vital bus power [ED] via inverters. The 125/250 Volts DC (VDC) electrical power system consists of two independent and redundant safety related Class 1E DC electrical power sources. Each source consists of two 125 VDC batteries, with one battery charger for each battery. The 250 VDC source is obtained by use of the two 125 VDC batteries connected in series. Each 125/250 VDC motor control center is made up of a positive, a negative, and a neutral bus. The positive and negative poles of one battery are connected to the positive and neutral buses while the positive and negative poles of the other battery are connected to the neutral and negative buses, thus forming an ungrounded 125/250 VDC system.

Each 125/250 VDC motor control center is equipped with a ground detector [DC-GDET] to alarm in the event that any of the three buses is grounded. This ground detection meter-relay measures current flow through known resistances across the negative and neutral buses. There is also an intentional connection to station ground between the detector circuit resistors, which inherently has no effect on the circuit when there are no other grounds on the DC system. However, when other grounds occur on any of the three buses, a new current path is introduced into the ground detector current loop via station ground and the intentional ground connection at the detector circuit. This ground current upsets the normal current measured by the meter-relay, causing an alarm when the setpoints are exceeded. Setpoints are chosen to alarm even on high resistance grounds to ensure early detection.

The Auxiliary Feedwater (AFW) System [BA] provides a safety related source of feedwater to the secondary side of the steam generators in the event of a loss of normal feedwater [SJ] flow to remove reactor decay heat and to prevent over-pressurization of the Reactor Coolant System [AB] and the resultant reactor coolant expansion that could result in fuel damage. Among other requirements for the Auxiliary Feedwater System is the requirement to remove decay heat via the steam generators in the event of a small break loss of coolant accident. The specific amount of Auxiliary Feedwater flow required is dependent on the break size, but within the Auxiliary Feedwater System capacity for all break sizes that require Auxiliary Feedwater.

Technical Specification(s):

Technical Specification (TS) Limiting Condition for Operation (LCO) 3.7.5 requires three Emergency Feedwater (EFW) Trains, consisting of 2 trains of AFW and the Motor Driven Feedwater Pump (MDFP), be operable while the plant is operating in Modes 1, 2, 3, and Mode 4 when the steam generator is relied upon for heat removal. With one required train of EFW inoperable in Modes 1, 2, or 3, TS LCO 3.7.5 Condition B requires the inoperable EFW train be restored to Operable status in 72 hours (3 days). If this action and associated completion time cannot be met, or if two EFW trains are inoperable, then TS LCO 3.7.5 Condition D requires the plant be placed in Mode 3 in 6 hours and in Mode 4 in 12 hours.

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DESCRIPTION OF EVENT:

On April 7, 2010, with the station in a refueling outage and the reactor defueled, an unacceptable ground of 0.36 milliamps was identified on DC motor control center 2 [DC-MCC], which was outside the acceptable range of 0.40 to 0.80 milliamps. Ground indications occur occasionally on the DC motor control centers, and sometimes the grounds coincide with rainy weather. The corrective action documents originated for the unacceptable ground were classified as routine/steady state work of low risk/significance. Before the unacceptable ground could be resolved, on July 2, 2010, with the station in Mode 1 and at approximately 100 percent power, the ground further degraded into a hard ground ("event date") of -0.10 milliamps.

Prior to the ground degrading into a hard ground, on June 17, 2010, with the station in Mode 6, Refueling, surveillance test DB-SP-03164, "Auxiliary Feedwater Train 2 Flow Path to Steam Generator Verification," was performed. During this surveillance test the flow from Auxiliary Feedwater Train 2 to Steam Generator 2 was greater than acceptable, and the Auxiliary Feedwater Pump 2 Discharge Control Solenoid Valve (FV6451) (Target Rock model 302438-1) [BA-FSV] was found cool to the touch locally with the breaker closed. In early June 2010, a major storm with numerous lightening strikes moved through the plant property and was believed at the time to be the reason for the failure. The Discharge Control Solenoid Valve was repaired June 23, 2010, and the surveillance test performed satisfactorily.

On July 17, 2010, with the station in Mode 1 at approximately 100 percent power, monthly surveillance test DB-SP-03161, "Auxiliary Feedwater Train 2 Level Control, Interlock and Flow Transmitter Test," was performed. During this surveillance test, the discharge control solenoid valve (FV6451) for Auxiliary Feedwater Train 2 was again found cool to the touch locally with the breaker closed. A Problem Solving and Decision Making team was formed, which identified a correlation between the unacceptable ground indicated on DC motor control center 2 and the open power sources fuses/degraded resistors on the Target Rock position controller circuit boards for the Auxiliary Feedwater Pump 2 discharge control solenoid valve. The ground on DC motor control center 2 resulted from a main transformer oil pump flow indicating switch [EL-FIS] for cooler group 3 being stuck in the closed position, which was corrected on July 19, 2010. On July 20, 2010, after rework of the Target Rock position controller circuit board for the Auxiliary Feedwater Pump 2 discharge control solenoid valve (FV6451), Auxiliary Feedwater Train 2 was returned to service.

A past operability evaluation completed on August 16, 2010 ("discovery date") determined that Auxiliary Feedwater Train 2 could not have performed its intended function for 18 days between July 2, 2010, when the hard ground occurred, and July 20, 2010, following repair of the hard ground. This ground affected the Auxiliary Feedwater Pump 2 discharge control solenoid valve (FV6451), which caused Auxiliary Feedwater Train 2 to be inoperable for this 18-day period.

CAUSE OF EVENT:

The direct cause of Auxiliary Feedwater Train 2 being inoperable for longer than allowed per the TS Limiting Condition of Operation was the existence of a hard ground on DC motor control center 2 due to the main transformer oil pump flow indicating switch for cooler #3 being stuck in the closed position resulting in the failed AFW discharge control solenoid valve (FV6451). This ground fault, which existed for approximately 18 days, induced a voltage greater than the design capacity of the position controller

NARRATIVE

CAUSE OF EVENT: (continued)

board for the Auxiliary Feedwater Pump 2 discharge control solenoid valve. While the position controller board was designed to a DC power supply of 90 to 140 VDC, DC grounds can cause elevated power supply voltages in excess of 140 VDC and as high as 280 VDC relative to ground.

The root cause of this event is a lack of program implementation by the site organizations for DC ground hunting. No organization had advocated ownership for the process of DC ground hunting or reinforced expectations for the prioritization and resolution of DC system grounds, and there was not a clear ownership for the process of DC ground hunting. This resulted in a mindset for all organizations to inadequately prioritize DC ground indications.

ANALYSIS OF EVENT:

The ground on DC motor control center 2 resulted in de-energization of the Auxiliary Feedwater Pump 2 discharge control solenoid valve. This resulted in the valve failing open, which would have allowed full Auxiliary Feedwater flow to the Steam Generator upon a start of the Auxiliary Feedwater Pump Turbine. If the operators did not carry out proceduralized actions following an Auxiliary Feedwater Pump Turbine start, this failure could lead to overfilling the aligned steam generator, which could cause water carryover into the steam lines and result in the loss of both trains of Auxiliary Feedwater. However, the incremental conditional core damage probability calculated for the period of time the discharge control solenoid valve was in a de-energized state resulted in a determination that this issue was of very low safety significance.

Reportability Discussion:

With the AFW Train 2 discharge control solenoid valve control board power fuses blown and/or the electronics degraded, the valve was not capable of performing its design function of controlling AFW pump discharge flow. AFW Train 2 was inoperable for approximately 18 days, which exceeded the Completion Time specified in TS LCO 3.7.5 to restore the train to Operable status or shutdown the plant. Therefore, this issue is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as it resulted in operation of the plant in a condition prohibited by the Technical Specifications.

AFW Train 1 and the MDFP were not affected by the condition with the ground on DC motor control center 2. AFW Train 1 remained operable per TS LCO 3.7.5 during this time except for brief periods of time (each less than the 6 hours permitted by TS 3.7.5 Condition D) for testing or system realignments. The MDFP remained operable per TS LCO 3.7.5 during the time AFW Train 2 was inoperable due to the ground; therefore, no loss of safety function occurred as a result of this issue.

CORRECTIVE ACTIONS:

The cause of the ground on DC motor control center was corrected on July 19, 2010, and the position controller circuit board for Auxiliary Feedwater Pump 2 Discharge Control Solenoid Valve was repaired and Auxiliary Feedwater Train 2 was returned to service on July 20, 2010.

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CORRECTIVE ACTIONS: (continued)

Procedure DB-OP-06322, "Locating Grounds on the Station 250/125 VDC System," will be revised to identify that DC ground hunting actions will be initiated when grounds are outside the acceptable range of 0.40 to 0.80 milliamps, and that visual inspections of the fuses for all Target Rock Solenoid Valve position controllers will be performed as part of these ground hunting actions. Additionally, the procedure will be revised to identify that these actions should not be considered steady state/routine priority work with low significance/risk, and related corrective action documents should not be closed until the DC ground is resolved.

Guidance has been provided to the operators performing station rounds to require initiation of a corrective action document when the reading differential exceeds 0.20 milliamps since the last reading, and to invoke the implementation of DB-OP-06322 when DC grounds are outside the acceptable range of 0.40 to 0.80 milliamps.

The Operations Manager will communicate to station management that the Operations section is the owning authority for the DC ground hunting process and will coordinate the involvement of other interfacing organizations.

Training on the cause of this event including a focus on conservative assumptions and the proper prioritization of DC system ground indications will be provided to Site Supervisors, Operators, Engineering Support Personnel, and Maintenance personnel responsible for screening notifications.

PREVIOUS SIMILAR EVENTS

No prior similar Emergency Feedwater position controller circuit failures attributed to station DC system grounds were identified.